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VETERINARY MEDICINE

DECEMBER CONTENTS 1948

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In general, 30% of veterinarians react positively to the agglutination test for brucellosis.

The brucellergen (Huddleson) skin test for human brucellosis is the best of such tests. Its chief value lies in the negative reaction which fairly definitely rules out infection.

An occasional case of brucellosis in man, demonstrated by the culture of the organism from the blood, does not develop a positive agglutination reaction. Such cases are rare, but have been reported.

Human brucellosis is always acquired from an animal. While it is possible for a mother to infect her young *in utero* or through her milk, no such case has been reported. Brucellosis in man would soon cease to exist if the disease were eliminated from animals.

Four of 200 boys in a boarding school were suffering from what was diagnosed clinically as brucellosis. They reacted positively to the agglutination test. Then all in the school were given the test and 15 reacted in titers exceeding 1:1000. They were not ill and there was nothing in their history that could account for infection.

In man a positive reaction to the agglutination test for brucellosis, even in high dilution, does not always indicate infection past or present. An agglutination test that is negative at the beginning of an illness, but appears later and in which the titer continues to rise higher and higher is strongly indicative of infection.

Female cats normally have two heat periods annually — in the spring and in the fall; but a summer heat period is not unusual.

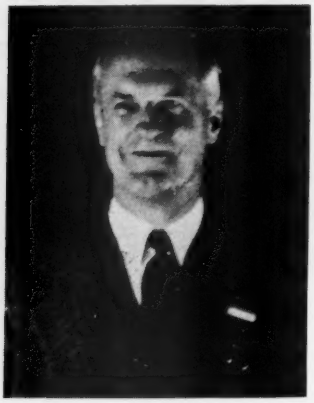
Six months is regarded as the most desirable age at which to spay cats, and three months for castration in the male.

All long haired breeds of cats are said to suffer from ear mites at some time. *Otodectes cynotis* are less common in other breeds.

Urethral plugging is common in male cats, and even more common in those that have been neutered. The impacted mass of mucus and cell detritus can usually be forced back into the bladder by first evacuating the latter through a hypodermic needle and then injecting 10 to 20cc of saturated solution of sodium bicarbonate into the urethra. This solution dissolves or breaks up the sediment in the bladder to a degree that the plugging of the urethra does not immediately recur.

In cats having a high temperature, examine the head and neck carefully for abscesses. Abscesses in these locations commonly contain a needle and a length of thread, which, of course, must be removed. It is somewhat embarrassing to examine such a cat and send it home with a bottle of medicine and a few days later have the owner bring in a threaded needle, the point of which she has discovered protruding through the skin. Abscesses of the head and neck in cats from injuries received in fighting are far less common than one would suppose, because of the thick and extremely tough skin in those areas.

Dean Dick Dead at 71



GEORGE ALEXANDER DICK, 1877-1948

Dr. G. A. Dick, professor emeritus of animal industry and former dean of the School of Veterinary Medicine, University of Pennsylvania, died Oct. 15, 1948 at the University Hospital.

Doctor Dick was born in Ontario and came to the United States before he had completed his common schooling. He received the degree of V.M.D. from the University of Pennsylvania in 1904 and B.S. in Animal Husbandry from Iowa State College in 1919. He practiced in Kane, Pennsylvania, 1904-16, and was connected with the veterinary faculty of the University of Pennsylvania from 1917 to his resignation in 1946; dean 1931-46; since 1937 director of the School of Animal Pathology.

The basis of all disease control is knowing the location and the prevalence of disease. This can be known only through a good vital statistical service. — JAMES H. STEELE

Veterinarians suffer from a peculiar disease deriving from Brucella. It has not been seen in others. Within two years of beginning cattle practice, about 90% of those engaged in such practice develop a papular eruption on the arm which appears about four hours after delivering a calf or removing a placenta from an infected cow. It is annoying and painful and persists for two to four days. If the attacks recur frequently over a prolonged period, a chronic state develops that may be incapacitating. Huddleson says that the free application of bovine serum, having a titer of 1:5000 or higher, to the hand and arm after exposure is the best preventive of the eruption. However, preventing exposure by the use of a rubber glove and sleeve is much to be preferred and should be a must for all veterinarians beginning cattle practice.

In a brucellosis survey of several rural townships in Indiana, brucellosis was found in one or more animals on every farm in which a case was found among the persons living on that farm.

Trimeton is the trade name of an antihistaminic (prophenpyridamine) that reached the market just in time for the fall hayfever season. On a test it relieved 83% of 227 cases of hayfever, hives, allergic skin reactions, etc.

Fermentation caused by certain rod-shaped bacteria in chicken house litter is reported to produce a vitamin component known as "animal protein factor" which is as effective as liver extract in the treatment of pernicious anemia.

A Useful Appliance

An electrically heated wax pencil for sealing inoculated eggs has been devised at the Department of Health, Toronto. It is of comparatively simple construction and made of materials readily available.—*Science,* 108:2805, p. 364. (October) 1948.

Do not add a boar of unknown history to a brucellosis free herd until he has reacted negatively to three brucellosis tests made at 30-day intervals. And it is better not to do it then. Only boars from completely negative herds should be trusted.

More than 100 owners of herds of purebred swine have enrolled them in an Illinois Department of Agriculture project for the accreditation of brucellosis free herds of purebred swine. Two negative agglutination tests, 30 to 90 days apart, qualify a herd for accreditation.

At a meeting of the Minnesota State Veterinary Medical Association July 13 and 14, 1910, Dr. W. L. Beebe moved that a committee be appointed to draft a code of ethics and report to the association at its next annual meeting. The motion carried and Beebe was made chairman of the committee.

Injections into the ear vein of swine for anesthesia are facilitated, in fact made very simple by encircling the base of the ear with a rubber band. But be sure to remove the band when the injection is complete. One's face is apt to get very red if, when the owner comes in to pay for an operation on a good boar, he asks if there is any additional charge for sloughing off the ear.

One author has listed 115 symptoms of human brucellosis; fatigue is the most constant one.

In persons, laboratory tests for brucellosis other than culture of the organs from the blood are subject to question. From 10 to 20% of the general public and from 50 to 100% of veterinarians react to the agglutination test.

The treatment of cattle harboring ox-warbles is compulsory in Britain. Treatment must begin within seven days of March 15 and be repeated at not longer than 32-day intervals until June 30.

A treatment for abscesses consists in aspirating the pus with a hypodermic syringe as soon as the abscess is "ripe" and then injecting penicillin into the abscess cavity. One treatment is said to be sufficient. No bandaging or other dressing is required and no scar results.

"Animal Factor"

In addition to all the known nutrients, another factor called "animal factor" is necessary for normal reproduction when breeders are fed rations high in corn and soybean. This factor may be supplied by animal protein concentrates, condensed fish solubles, dried cow manure, fresh droppings, and to a less extent by some fermentation by-products. While only small quantities of the animal factor are required, it appears to be absolutely essential for normal reproduction and early survival of chicks.—*World's Poultry Science Journal.*

Disease Prevention in 15 Seconds

The Hayward, California, area is all out on this pneumoencephalitis vaccination. We dropped by the John Olson ranch to watch him and his wife work over a bunch of pullets. After five minutes' instruction, Mrs. Olson was an expert with the hypo. John held the bird's head down and she grabbed a pinch of skin at the end of the keel and shoved the inch-long needle into the body cavity, entering the abdomen just behind the keel. The needle was pointed in and down towards the head.

In a short time the Olsons were vaccinating a bird in less than 15 seconds. The shot is repeated in two to six weeks. The immunity lasts as long as the average poultryman would keep a bird.—*California Farmer.* Reprinted in *Poultry Digest.*

Stomach worms are the No. 1 enemy of sheep and, together with tapeworms, lung worms, nodular worms, liver flukes and other parasites, are responsible for greater losses than all bacterial diseases combined.

Midwestern sheep harbor about 40 species of harmful internal parasites, but only the common stomach worm, the nodular worm, Trickostrongyles, Ostertagia, hookworms, tapeworms, lungworms and coccidiosis are economically important.

A record price for steers at the Kansas City stockyards was made in June, 1948, when a load of 18 sold for $685 a head. Their average weight was 1903 pounds and the price $36 per cwt. In the same month a load of Hereford heifers (average weight 732 pounds) sold for $37 per hundred.

The dairy, livestock, and poultry industries have a big job cut out for them in the disease field. The nation's livestock industry is suffering a tremendous loss every year from the ravages of disease. We have not only those common diseases such as brucellosis; there are new ones on the horizon that promise to be of equal if not greater importance.—*Hoard's Dairyman.*

No sanitary measures, that are practicable in commercial poultry production, will protect chickens from exposure to cecal coccidiosis. This being the case, there are many advantages in infection at a time, place, manner, and under conditions selected by the poultryman rather than chosen by accident. The coccidiosis control method by which chicks at about four weeks of age are given a calculated dose of *E. tenella* organisms in wet mash, then given sulfamethazine in the same way or sodium sulfamethazine in the drinking water has much to recommend it.

Dipping Lameness in Sheep

A severe lameness develops in one to all legs of 20 to 40% of some flocks of sheep in New Zealand after dipping in either rotenone or gammexane (benzene hexachloride). In the majority of cases recovery occurs in 12 to 14 days, but some cases persist much longer. There is no mortality connected with the attack, but considerable loss in condition ensues.

The lameness never occurs in flocks dipped in a fresh suspension but only after the dip has been used two days or longer and has become very foul from contamination and bacterial growth.—Rept. in *Australian Vet. J.*

Fox Diseases

It must be realized that foxes die of conditions other than those due to parasites and the Carré virus. This impression is readily obtained due to the fact that these conditions cause greater losses than any others and are the most written and talked about. The early fox rancher quickly learned what he could and could not do in the husbandry of his animals. This information has been recorded by the Canadian (Prince Edward Island, cradle

Foxes die of other conditions than parasites and Carre virus

of the fox industry) for industry, but little information has been published relative to the causes of death. This information has been obtained from losses suffered by the fur farmer and it is believed that the information will facilitate the early diagnosis of disease on the fox ranch, and the control of epizootics.

The Shrew Once a Villain; Now a Benefactor

The discovery, by a University of California expedition in Africa, that the elephant shrew is one of the very few animals susceptible to malaria, and thus of great value in medical research, recalls that the European shrew was once thought to be of outstanding importance to veterinarians.

In all, or nearly all, books on the diseases of animals, published prior to 1750 and in most of those published during the following 50 years, infections were a great puzzle to the authors. They knew naught of bacteria, pathogenic molds, protozoa, viruses and Rickettsia. Hence they attributed infectious disease and local infections, to objects, persons, animals or conditions frequently present when the infections occurred. This accounted for the many ills attributed to bad air (malaria) and night air and to the influence of the stars or other heavenly bodies (influenza).

A veterinary writer of the Middle Ages and the Renaissance who could not name an average of 20 causes for each disease he described, could not hope for much popularity for his books. It may be added that he was expected to enumerate some 20 cures for each disease and seldom disappointed his readers. Wm. Dick of Edinburgh once stated that he had compiled a list of 75 infallible cures of glanders, which convinced him no cure was known.

To return to the subject which is the shrew: Probably no other single agent is mentioned so frequently, in the older veterinary works, as a cause of disease in animals as the bite of a "shrew mouse". It is unlikely there is any ailment of animals, not obviously of traumatic origin, that some authority did not attribute to this little villain (shrew formerly meant villain). For hundreds of years writers on animal disease either began or ended his list of the causes of nearly all ailments with "bite of a shrew mouse".

The shrew, which is not a mouse or even a rodent, possesses an interest to physiologists and nutritionists aside from its usefullness in malaria research and its former contributions to etiology of animal diseases. Some species of this animal are the smallest mammals known and have the highest metabolism rate of any animals. The metabolism rate of the shrew is more than twice that of the smallest mouse. An adult of the smaller species of shrew weighs only 4.5gm. Zoologist Pearson of the University of California computes that the smallest possible adult mammal would have to weigh 2.5gm (one-twelfth of an ounce). If it were smaller, its metabolism rate would be so high that it could not eat fast enough to keep its body fires burning. The smallest shrew approaches this point since it eats voraciously, insects, worms, mice and other shrews, just about all the time. If it is deprived of food for even a few hours it dies.

Will You Have Silver or Platinum Foxes for Lunch?

One of the most interesting guests I have had the pleasure of entertaining recently was Dr. Klemola, of Helsinki, Finland. He was in the country seeking further information relative to the diseases of fur bearing animals.

Among the many interesting things which this gentleman told me was that in his country they were not only feeding fox carcasses to their fur animals, but also were using them for human consumption.

Asked how many foxes he had eaten during the war, he wryly answered "probably 200." They are not half bad when one has to eat them, because one becomes an artist in disguising them with garden vegetables. Asked what he liked most in the United States, his reply was "fresh fruit and the cigarettes."

—T. T. CHADDOCK

Genesis of Mastitis

Dr. James M. Murphy presented a comprehensive analysis "The Genesis of Udder Infection", based on seven years of observation of mastitis in two large herds, at the 50th and 51st annual sessions of the U. S. Livestock Sanitary Association (1946, 1947).

He offers evidence that an "age factor" is of significant importance in the development of streptococcic mastitis, in that the *Streptococcus agalactiae* was frequently present in the udders of young animals without a resulting mastitis, but that about the third lactation and later the clinical evidence of mastitis appears. Murphy admits the theoretical possibility of holding streptococcus mastitis to a minimum by having only young animals in the herd, but also that this is not a practical solution of the problem.

It must be disturbing to the practitioner, that Murphy did not find the application of rigid sanitary practices to be of value in limiting the spread of the infection. Chlorine, 200 p.p.m., disinfection of udders, milkers' hands, utensils, etc., as well as keeping animals showing clinical evidence last in the milk line, was without effect on the spread of the disease. Only complete segregation of infected cows into a different animal habitation away from clean animals seemed to exert a favorable influence.

Only when animals were changed to a ration of cold wet pasture did food or climate seem to exert an unfavorable influence. No evidence is presented to indicate unusual breed susceptibility to mastitis, nor were milking methods of much importance. Murphy holds that his observations render untenable such generally accepted predisposing factors as "teat patency", and "obvious injury to the teat". It seems a reasonable statement that "as long as the nature of the 'age factor' as it relates to *Str. agalactiae* infection of the bovine udder remains unknown, no direct control over it can be exercised".

On the other side of the picture, Ormsbee and Schalm of the University of California reported during the late session of the American Veterinary Medical Association in San Francisco, that they had kept records on some herds to determine the importance of the "age-factor" hypothesis. In essence they say that on the basis of their results, "it is concluded that an age factor does not play a decisive role in the spread of *Str. agalactiae* organisms. Rather, in the presence of extended exposure, randomly distributed and transitory predisposing circumstances are regarded as the major factors in the spread of this pathogen. Therefore, the inclusion of sanitary practices and segregation in programs for the control of *Str. agalactiae* is regarded as sound."

This leaves the matter of an age-factor still controversial.—*R. R. Dykstra.*

Nurse cows with infected udders constitute no hazard to heifer calves destined for dairy replacements. Moreover, the use of such cow affords the most practical means of utilizing mastitis milk and of feeding dairy heifer calves, according to *Dr. S. D. Johnson*, N. Y. State Veterinary College.

Cystic ovary must not be thought of (or treated) as a local ailment of the organ. It signalizes a hormone imbalance that profoundly influences the whole organism, somatically and psychically.

In bulls *Trichomonas foetus* ordinarily lives only on the surface of the penis and preputial membranes. It produces no symptoms or lesions upon which clinical diagnosis may be based. At present, the disease in bulls is regarded as incurable but two methods of treatment that give promise are being studied.

Of all the problems we face in accelerating the brucellosis eradication program the most serious is that of inadequate personnel. There is just one place where there is sufficient veterinary personnel — among practitioners. We must have the practitioner's help to do the job. I plead with all practitioners, all over the country to assist in the brucellosis program. If you don't, the job can't be done.—*Chief Simms.*

That the annual loss of meat due to diseases of farm animals is estimated to be greater than the quantity needed to provide full meat rations for 3,000,000 persons, has been reported by Dr. W. R. Wooldridge, Scientific Director of the Animal Health Trust of Great Britain. There was a loss of 1,500 tons of liver due to fluke infestation and 37,500 tons of poultry meat due to disease. Doctor Wooldridge suggests that a nationally coordinated abattoir service for Britain with meat inspection carried out under an adequate veterinary supervision would be of great benefit among livestock on the farm. Since only about 150 veterinarians are being graduated each year, it would seem that more veterinary colleges or larger classes would be necessary to put into effect the suggestion of Dr. Wooldridge.

Veterinary Problems in Poultry Production

By W. R. HINSHAW, D.V.M., Ph.D., Davis, California

Research at the University of Wyoming discovered that a reason for poor hatchability of eggs in the Mountain States is embryo oxygen privation. At elevations of 7,000 feet above sea level and higher the oxygen pressure is insufficient to keep the developing embryo alive.

The second edition of a book on poultry diseases which has become a standard reference in its field has just been released by the publishers. It is "Diseases of Poultry" and is edited by Drs. H. E. Biester and L. H. Schwarte of Iowa State College. Dr. Schwarte has replaced Dr. L. Devries as co-editor of the second edition, which has been completely revised by the 33 cooperating authors.

Avian monocytosis (see Jungherr, in Diseases of Poultry, edited by Biester and Schwarte, 2nd edition, 1948:623) has more synonyms than almost any other disease. It is known as pullet disease, blue comb, X disease, XX disease, new wheat disease and at least a dozen others. Almost as numerous are the reported causes of the disease, which still is classed by most investigators as of unknown etiology.

The symptoms include a sudden affliction which is characterized by depression, lack of appetite, a watery diarrhea with excessive urates, distention of the crop with sour smelling contents, and cyanosis. In laying flocks, a severe drop in egg production is observed.

The percentage mortality is usually low (average 5% according to Jungherr) but may range from 0 to 50%. The course of the disease extends over a period of one to two weeks, but egg production may lag for several weeks.

Lesions seen on necropsy include marked dehydration, necrosis of the liver and pancreas, hemorrhages on the serous membranes, increased mucus in the intestine, and ruptured ovules. Bacteriological examinations of tissues fail to reveal any bacteria and this serves to differentiate the disease from such infectious diseases as fowl cholera and fowl typhoid.

In addition to the sanitary measures usually recommended for control of infectious diseases, Jungherr and his associates have determined that potassium in some form appears to have merit as a therapeutic agent for this disease. Methods of administering potassium include the addition of 2% molasses to the drinking water, or potassium chloride at the rate of 0.5%, for seven days. If necessary, 1.5% potassium chloride may be added to the feed for seven more days.

Within the past few weeks two companies, Lederle Laboratories and Vineland Poultry Laboratories, have been issued federal limited licenses for the sale of live-virus vaccine for the prevention of New Castle disease (avian pneumoencephalitis).

A method for detection of hemagglutination inhibition antibodies in non-incubated eggs which may be used to diagnose avian pneumoencephalitis (Newcastle disease) is reported by Schmittle and Millen (*Cor. Vet.* 38, p. 306, 1948). By this technic, the authors say that evidence of the disease in a laying flock can be determined accurately, within a few hours after the receipt of eggs shipped to a laboratory in ordinary egg cartons.

At least three changes in nomenclature of the causative agents of diseases of poultry are given in the 6th edition (1948) of Bergey's Manual of Determinative Bacteriology. The new name for the causative organism of fowl cholera is *Pasteurella multocida*, instead of *Past. avicida*. Incidentally, this is also the new species name for Pasteurellosis of all animals. A single species name has been accepted as the results of research work of Rosenbusch and Merchant (*J. Bact.* 37:69, 1939), which showed that there is no justification for using the animal source as the basis for naming the species.

Salmonella gallinarum instead of *Shigella gallinarum* is the newly accepted name for the cause of fowl typhoid. This change was made as the result of a new policy to include in the *Salmonella* genus certain bacteria which have the accepted antigenic components of the *Salmonella*. Another example is the causative agent of human typhoid which is now designated as *Salmonella typhosa* instead of *Eberthella typhosa*. It will be recalled that in a former edition, Bergey listed the fowl typhoid organism in this genus which has now been deleted from the Manual.

The third disease for which a new name has been proposed is avian spirochetosis. *Borrelia anserina* is now given as the cause of this disease. Previously used synonyms include *Borrelia gallinarum, Spirochaeta anserina, Sp. gallinarum,* and *Treponema gallinarum.*

Good Grass on Both Sides of the Fence

By W. E. IRWIN.* D.V.M.
Bartlesville, Oklahoma

THE grass *is greener* on the other side of the fence — sometimes. We have often made this snap judgment, as we have driven by beautiful farms, unconsciously comparing one pasture or field with another.

The successful feeder of livestock is far more accurate, although less direct, in his method of pasture or crop appraisal. He lets the animals themselves measure the *real* feeding worth of his different pastures or fields, as they eat or graze the crops. After all, his big interest is in producing profitable pounds of meat, rather than tons of hay or forage, since he markets his crops "on the hoof". He finds that the best crops, of both plants and livestock, come from *fertile fields.*

We have heard these old-timers observe, "the crops on the thin south 40 don't have any strength to them, and stock don't do good there". Such "south 40s" require strong fences, when surrounded by better grazing. Otherwise, the animals run "taste tests" and vote two to one in favor of jumping over the fence to the greener and richer grass.

Scientists now tell us that even their test-tubes back up this "animal sense". They find that crops grown on good soil carry more protein, vitamins, minerals, etc., in relation to the indigestible fiber, than crops grown on the poor "south 40". Seasonal and varietal factors also exert an influence on feeding quality.

In view of all this evidence, we plan to reserve our future judgments on the comparative worths of crops or pastures until we have looked at the livestock — and, Oh! Yes! the condition of the partition fences.

Veterinary Aspects of Declining Soil Fertility

We veterinarians have a deep interest in this problem, since we depend upon, and contribute to a prosperous and permanent agriculture. Prosperous stockmen employ and pay for veterinary services to insure greater production — profits from their feeding operations. Therefore, the veterinarian must take a responsible attitude toward such clients' problems, and give the best service possible. He realizes that it takes more than "shots" and "condition powders" to make money in a game as full of "high pressure" competition as our livestock industry. On the other hand, the client whose livestock fails to do well year after year is an unsatisfactory one, even though he does pay his bills. The animals in a community must "do good" to make for a good "practice".

The veterinarian sees more than sick livestock as he goes on his calls. He notices that nature has a cruel way of trying to hasten the destruction of the weak, be it soils, plants, or animals. Soils with declining fertility wash away faster. Weak plants grown on such soils seem more subject to damage from insect and disease pests, as well as early frosts. Lessened soil fertility may be a factor back of our needs for the constant introduction of new plant varieties to maintain profitable crop production. Under-nourished animals kept on sparse pastures have much more trouble combating parasites and low-grade diseases than well fed livestock. Animal traffic and consequent disease-exposure have increased to further aggravate the indirect effects of declining feeding values. Thus, animal disease-control is definitely more complicated today than it was in grandfather's day.

Basic Conservation Practices

Livestock farming, if kept in balance with the farm's carrying capacity, is basic in proper soil management. Crop rotation pays in the long run, although we are tempted to stress-"cash crops" during periods of high prices. Pastures need to be recognized as the proper crop for steep slopes — especially in the years ahead.

The Iowa rental contract plan, which makes the tenant a partner in proper soil management, will do much to encourage the man on the land to follow the right practices. The average farmer already knows more than he practices.

Conserve for Posterity

With an ever-increasing population at home, and the demands from a hungry world abroad for more food, proper soil management becomes everyone's concern. Those farmers and the returned GI's who saw agricultural conditions in foreign lands were made more conscious, that only good soil can feed the plant so that we and our herds may remain the best fed in the world.

After seeing lands with thousands of years of continuous cultivation in their history it is inescapable that GI's return and join us in urgently pleading that "the grass must be made greener and better on *both* sides of the fence".

The biggest crop in the United States is not corn nor wheat but grass. Its yield is reckoned in milk, meat, wool, leather, and other livestock products.

*Farm Department, Phillips Petroleum Company.

Comments Upon Animal Health Factors

By R. R. DYKSTRA, D.V.M.

It is recorded that fishermen in some parts of the world on catching crabs "cut a tendon serving the claw, in order to prevent them from pinching their captors or injuring each other." It is contended that the operation is painless because the crab does not "throw off" the claw operated upon, though whenever danger or pain threatens it a claw is easily discarded, and then replaced by a new claw.

Recently an inquiry—somewhat as follows—came to our desk: Is there a breed of dogs known as the "Bob-tailed Shepherd?" We had to consult our book of dog breeds and there it is recorded that the Old English Shepherd is usually born without a caudal appendage though short tails at birth are by no means uncommon—in fact, it is stated that if there are at birth tails that will probably become two inches in length at maturity it is customary to resort to an amputation at the first joint beyond the body. The Old English Shepherd therefore carries the nickname of "Bob-tailed Shepherd."

In the 1947 Collected Papers from the Royal Veterinary Institute, Stockholm, Dr. Sven Rubarth reports informatively on Hepatitis Contagiosa Canis—an apparently acute virus disease—which is more prevalent than all other canine diseases excepting only distemper. Most cases occur during the first three months of life though dogs up to 13 years of age have succumbed. Clinically, no characteristic symptoms have been observed—as a rule it "is marked by fever and apathy, often by vomiting and diarrhea, and sometimes convulsions." On autopsy there are some evidences of acute hepatitis and splenitis; in the stomach and intestines there is a submucous edema; in the central nervous system there is a serous effusion with lytic degeneration of neighboring nerve tissue, and regressive changes have been noticed in the bone marrow and smaller veins. It appears that specific changes consist of nuclear inclusions (Cowdry's type A) in the cells of most of the structures in which occur the regressive lesions. The disease is usually sporadic but may assume an enzootic character in some kennels. Animals that have recovered from an experimental inoculation have a degree of immunity. In the dogs autopsied during 1946 at the Royal Veterinary College — a total of 526 — about 7.41% had lesions of this condition. Research is being continued by Doctor Rubarth and his associates. Veterinarians in the United States will follow the work with interest.

Sodium hydroxide in 2% solution, or liquor cresolis saponatus in 1% strength, is effective in devitalizing the virus of avian pneumoencephalitis (Newcastle disease) after an exposure of three minutes. A 3% solution of carbolic acid is also lethal to this virus after an exposure of three minutes although more dilute solutions or shorter periods of exposure fail to render it innocuous.

McClymont, in the *Australian Veterinary Journal* reports on the comparative value of urea and protein for supplementing low protein rations for growing cattle. Based on his research work he tentatively concludes:

1. "That the efficiency of urea-nitrogen for stimulating growth, or for increasing the efficiency of food utilization is not greatly, if at all, affected by the presence or proportion of grain as a supplement to a low-protein roughage such as wheaten chaff."

2. In the light of his findings "the possible commercial use of urea, with the present price structure, urea can not compete with protein concentrates, but where protein concentrates are needed, but are highly priced or not available, urea can be used economically for some purposes."

Many cattle owners are quite enthusiastic about the "loose housing barn" for their animals. It is in fact a barn always open on one side. It is hard surfaced only in front of the manger, and at the exit or entrance. These areas are cleaned daily. Otherwise, manure is permitted to accumulate to be removed to arable land when convenient. Liberal clean bedding must be supplied daily. This compacts into a firm bed, and its heating, with ample bedding, makes the quarters comfortable. If the litter becomes wet or soggy, mix in it ten pounds of hydrated lime for each 100 sq. feet of floor space—repeat every two weeks if necessary. Cattle affected with diarrhea should be kept out. Housed in this manner, even high-producing cows do not fall off in the milk flow, and the incidence of sore knees and hocks, and mastitis is much reduced—the latter probably because of fewer injuries. Horns are a source of danger in housing of this type.

Veterinary Medicine in Korea

By B. D. BLOOD,* D.V.M.
Seoul, Korea

KOREA, with its 30 million people, is the world's 13th largest country in point of population. Geographically, it consists of the peninsula projecting from the mainland of Asia, and of several thousand adjacent islands —many of them mere rocks. It is washed on the east and west by the Sea of Japan and the Yellow Sea. On the north it adjoins Manchuria and the Maritime Province of Siberia. The area of Korea is 85,228 square miles, slightly larger than that of Minnesota or Utah. The character of the country is mountainous. There is no spot from which mountains do not form a part of the landscape. Korea has a monsoon climate, about half-way between the continental climate of China and the marine climate of Japan. Temperatures in South Korea are very similar to the middle-western U.S.A. for corresponding seasons of the year.

Koreans resemble the Chinese and Japanese in physical type, but are culturally distinct. They have a language of their own, said by linguists to differ from Japanese or Chinese as much as the French language differs from German or Russian.

Although one of the oldest countries in the Orient, with recorded history dating back to before 2000 B.C., Korea has never enjoyed political independence for any considerable period. Situated among more powerful neighbors—China to the west, Japan to the east and Russia to the north—she has long been a bone of international contention. In the Sino-Japanese War of 1895, Japan succeeded in eliminating one rival. China was compelled to relinquish all claim to control over Korea. In 1905, after the Russo-Japanese War, the other rival withdrew. Japan then became the self-appointed "protector" of Korea. In 1910, the protectorate came to an end, and Korea was annexed to the Japanese Empire. For the next 35 years, the Korean people experienced the oppression of Japanese rule.

With the end of World War II, in 1945, Koreans naturally expected the realization of their long-sought independence. But military necessity dictated the division of Korea at the line of the 38th parallel, with Soviet troops in the north and Americans in the south. The mission of these forces was (1) to repatriate the Japanese, and (2) to assist in establishing a democratic government for Korea. The first part of the mission was quickly accomplished. Three years have passed and there is still no agreement between Russia and the United States upon a Korean government. An all-Korean government, organized following elections sponsored by the United Nations, is preparing to assume power in South Korea. The Soviet-sponsored Communist government, ruling in the Northern Zone, remains aloof from efforts to establish a unified democratic government for all of Korea. The "iron curtain" is drawn tightly across the middle of the peninsula.

The foregoing geographic and historical background is presented because of its direct bearing on the development of veterinary medicine in the country.

The veterinary situation in Korea is, in many ways, similar to that in China†, but developments since the turn of the century have followed those of Japan more closely §. It was a Korean who, in the 7th century, introduced the use of drugs for animal treatment into Japan. This was in connection with the so-called Chinese herb medicine, common throughout the Orient in the treatment of both persons and animals. This system of animal treatment, thoroughly mixed with superstition and sorcery, was popular until the twentieth century and is practiced to some extent even today. It undoubtedly gained much of its original popularity from the warriors who, as a class, enjoyed great social influence; they insisted that their horses receive the best in care and treatment. The earliest known Korean veterinary publication is a book on animal surgery written by King Se-Jo in A.D. 1461.

Modern veterinary science, as practiced in the Western World, was introduced into Korea by the Japanese. In 1907, shortly after Japan became the protector of Korea, a Japanese official was dispatched to Korea to take charge of veterinary service. Henceforth, veterinary medicine, like practically every other aspect of Korean affairs, was dominated by the Japanese. Progress in any sphere of activity depended entirely upon the emphasis placed upon it in Japan and by the Japanese Governor General in Korea.

In old Korea there were three classes of society: the "Yangban", consisting of high officials, civil or military, together with nobles

* The author, who has been Chief Advisor for Veterinary Affairs in South Korea for the past two years, recently returned to this country.

† See, "Observations on veterinary medicine in China," by Dr. J. R. Beach, *Vet. Med.*, 42:7, pp. 261-262. (July) 1947.

§ See, "Veterinary education in Formosa and Japan," by Dr. J. W. Patton, *Vet. Med.*, 43:4, 149-155 (April) 1948.

and scholars; the common class, made up of farmers, traders and artisans; and the low class, consisting of menials, actors, monks, butchers, etc. Those who treated sick animals were grouped with butchers and were dealt, both socially and judicially, with the contempt considered proper for the lowest dregs of humanity. Although these class distinctions were officially abolished in 1894, their effects are still apparent.

Even today, veterinary medicine is generally considered as one of the less desirable professions (if it is considered as a profession at all)! As a consequence, likely young men are not often attracted to veterinary science as a career.

Veterinary Education

A temporary, one-year veterinary course was held in Seoul as early as 1906 by Japanese veterinarians. The purpose of this course was to train Koreans as assistant veterinarians who would then work in two practical fields: rinderpest control and livestock breeding. It was continued only a few years, and for several years thereafter veterinary education in Korea was non-existent. Meanwhile, a small number of Koreans studied veterinary science in Japan. Agricultural and professional education was so undeveloped in Korea, that the Japanese themselves are reported to have felt this defect acutely after the start of the recent Sino-Japanese war. A high official had stated the policy that "Koreans should be taught to follow, not to know." But the plan for turning Korea into a supply base for the war against China fell apart for want of trained personnel. In order to meet this crisis the Government started various types of short-term professional schools in 1939. Veterinary medicine was, at that time, added to the curriculum of the Agricultural Middle School of each province. A total of 11 years of education was sufficient to become a recognized veterinarian. Courses were of a very general nature with a large part of the time devoted to animal husbandry, agronomy and other agricultural subjects; graduates were licensed to practice in Korea or Manchuria. In addition to the training provided at Middle Schools, veterinary medicine was taught in a three-year course of combined veterinary medicine and animal husbandry at Suwon Agricultural College. Total schooling of graduates of this college was 13 or 14 years; they were licensed to practice anywhere in the Japanese Empire. The law provided that men with less than Middle School training, who passed a special examination, would be licensed as "limited veterinarians"; there are several in this category.

A survey of veterinarians in South Korea, taken in March 1947, showed them to have the following educational background:

University graduates (trained in Japan)	2
College graduates (trained in Japan 42; in Korea 11)	53
Middle School graduates (trained in Japan 210; in Korea 374)	584
Non-graduates (licensed by examination)	79
TOTAL	718

It was obvious, from the lack of well-trained native veterinarians, that the most important long-range project facing American veterinarians in Korea was improvement of the educational facilities. A carefully planned program was put into effect through the joint action of the Departments of Education and Public Health & Welfare. This over-all plan approached the problem from three aspects, namely: (1) formal professional education of college grade for veterinary students, (2) additional training for presently practicing veterinarians, and (3) enlightenment of the general public as to the scope of veterinary science and responsibilities of the veterinary profession.

The first postwar improvement in Korean veterinary education occurred in 1946 with the elimination of the veterinary courses from the curricula of Middle Schools. This left only the Suwon Agricultural College (Department of Animal Husbandry and Veterinary Medicine) in veterinary education. A year's trial proved this arrangement to be entirely inadequate, and in July 1947 the Board of Regents of Seoul National University agreed to the establishment of the School of Veterinary Medicine. Entrance requirements were raised to 12 years of prior education, the same as for medical, engineering and other university courses. Veterinary medicine and animal husbandry were separated, with the latter remaining as a pursuit taught in the agricultural college.

Professional subjects were increased in the new four-year curriculum in order to approach standards set by modern veterinary colleges elsewhere in the world. The degree offered is Bachelor of Veterinary Science. Postgraduate work may qualify the student for more advanced degrees. The school year of 1947-48 saw an enrollment of 29 freshmen, 3 sophomores and 4 juniors. These students were transferred from the agricultural college. In addition, a group of 57 were enrolled in a special pre-veterinary course in order that they mght meet the requirement of 12 years of prior education and become freshman students in 48-49.

The school occupies the buildings, on the university campus, which for many years housed the former Seoul Medical College.

Clinical medicine, which had been neglected under the old system, is emphasized in order that graduates may be better trained in the practical application of veterinary science. The school's veterinary hospital is the first institution of its kind in the history of Korea.

Assisted by two Koreans, Dr. B. D. Blood of Wabash, Ind., demonstrates various instruments before licensed Korean veterinarians attending a refresher course at the new school of Veterinary Medicine, the first of its kind in Korea.

Photo U. S. Army Signal Corps

There, complete facilities for treating and hospitalizing all species of animals are offered at very low rates. It was an interesting sidelight that the Korean word for "hospital" had always been used in connection with humans only. At first, its use in connection with a veterinary establishment created much comment. Now, both the name and the services offered are gradually gaining public acceptance. The record of patients handled during the first year is remarkable, considering that animal hospital facilities had never before been available.

Training abroad for Korean veterinary students has been complicated by the lack of funds and by the crowded conditions in overseas veterinary colleges. Despite this, two Koreans have begun training in the United States. One is enrolled at Michigan State College, the other is completing a year of training in the Zionsville laboratories of Pitman Moore Company. These two men are the first Koreans ever to receive veterinary training outside the Orient.

The benefits expected from improved education offered at the new College of Veterinary Medicine will not be evident for some years to come. In the meantime, Korea's veterinary service must be provided by veterinarians trained under the old system. Improvement of the training of presently licensed veterinarians has occupied a major place in the postwar scheme for raising Korean veterinary standards. A series of professional bulletins, covering various subjects, has been published. Written by American advisors and translated by the college staff, they were distributed to all licensed veterinarians. The complete lack of veterinary reference material written in the Korean language was, of course, only partially rectified by these bulletins. Then, in the early months of 1948, a series of four short-courses for licensed veterinarians was conducted at the veterinary college. A total of 145 men, including representatives from every province, received a week of refresher training in the practical aspects of veterinary service. Clinical demonstrations were the most popular part of these courses.

There is a very noticeable misunderstanding on the part of the Korean public as to the qualifications and responsibilities of veterinarians. In fact, there has been definite opposition from some quarters toward the improvements projected for the veterinary service. Efforts have been directed toward correcting this through proper public rela-

tions — radio talks, magazine articles, news releases, and other methods by which understanding and cooperation might be fostered. A valuable contribution in this regard has been a weekly column, presenting fundamentals of sanitation and disease prevention for livestock raisers, which appears in the *Farmers' Weekly,* a rural newspaper.

DR. YOUN BYUNG HACK

Doctor Youn is the first Korean veterinarian to receive training outside the Orient. He spent a year (1947) in the Pitman Moore Laboratories at Zionsville, Indiana, and later attended the School of Veterinary Medicine, East Lansing, Michigan.

Government Veterinary Service

During the Japanese rule practically all veterinarians who practiced their profession were employed by government or by government-subsidized agencies. In 1943, for example, records show that there were 1,776 veterinarians in Korea, of which only 30 were engaged in private practice. Animal disease prevention and related activities were functions of national, provincial or local government agricultural agencies. Various public health and veterinary food sanitation functions were conducted under police administration. About one-half of the veterinarians worked for these government agencies. The remainder were hired by the government-sponsored Korean Agriculture Association.

Key positions in all levels of government and other public services were always jealously guarded from Koreans by the Japanese. There were approximately 400 Japanese veterinarians in Korea at the end of the war. They held all the important veterinary positions, including those in government, education and research; there were no exceptions. The repatriation of these Japanese veterinarians resulted in the loss of the leaders in veterinary science in Korea. The remaining 700 Korean veterinarians in South Korea had always worked in subordinate positions under strict Japanese supervision. Their level of education was comparatively low and they had no chance to gain scientific and executive experience. Those who remained in the government service had neither the experience, inclination nor the authority to continue the service on the Japanese plane.

Government veterinary affairs were removed from agriculture and police agencies in November 1945. At that time they were consolidated, and the Bureau of Veterinary Affairs was established for the purpose of organizing and directing a national veterinary service; the new bureau was made a part of the newly created Department of Public Health and Welfare. This move placed the veterinary service in the same department with professions and groups involved in medical science and social welfare. It was believed at the time, that this would not only make for a more efficient utilization of such personnel and supplies as were available, but would also allow better coordination with other bureaus having related duties. Similar reorganization took place at the provincial and county levels of government.

A trial period of almost three years has passed since the inauguration of this system of government veterinary service organization; it has been only partially successful. In Korea, as elsewhere, government veterinary affairs fall into two main categories: social and economic. The system of organization now used there emphasizes the former and allows for neglect of the latter. The social phase, which protects the public health by inspection of foods of animal origin and by controlling certain animal diseases transmissible to humans, has made definite progress under administration of Public Health and Welfare. New standards of sanitation have been enforced upon the meat, dairy and seafood trades; measures for controlling animal diseases communicable to man have been taken as circumstances warranted. On the other hand, the economic phase of veterinary service has become increasingly neglected. The livestock industry in South Korea has deteriorated, and the lack of proper veterinary service is one of the reasons. Animal production, the job of the animal husbandmen, is planned and encouraged by the livestock section of the Department of Agriculture. Conservation of livestock is the responsibility of the veterinary profession; it is in this regard that the organizational scheme, whereby the veterinary service is consolidated under medical administration, has not been a complete success. Coordination, coopera-

tion and mutual support between the livestock-production experts and the veterinarians, so necessary for a progressive animal industry, have not been effected. There is little doubt that petty jealousies and grievances between the two groups, are partially to blame; but the prime reason is the lack of a common goal — diverging interests fostered by their remoteness in the government setup. This situation should improve if proposed plans for a Bureau of Animal Industry, within the Department of Agriculture, are adopted. Action in this regard is expected of the new government. Animal disease control functions would then be administered by officials intimately concerned with their success.

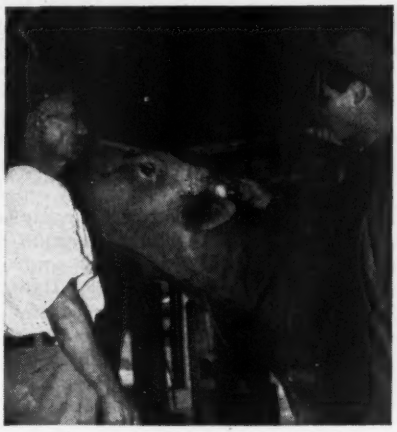
Animal Disease Control

The importance of the livestock industry in Korea is often underestimated. Korean economy is essentially an agricultural economy — an economy tuned to the production of rice. The ox is to the Korean rice farmer, what the tractor is to the American wheat producer. Animals are also the most important means of hauling farm produce and consumer goods to and from the cities, and even within the cities. Any marked reduction in work animals is soon reflected in the general economy. A good example is the rinderpest outbreak of 1902. Cattle losses were so great that crop production was seriously retarded. Then, during the winter, there was such a shortage of transportation for moving the available rice and the firewood into cities that prices became prohibitive to all except the very wealthy.

Korean cattle are of hardy constitution and gentle disposition. They are excellent draft animals, so much better than the Japanese oxen that as many as 100,000 head of Korean cattle were exported annually to the Japanese homeland. Work cattle in South Korea now number approximately 800,000 head, an estimated 65% of the all-time high of 1938.

Korea has always been especially exposed to the entrance of animal diseases because of its geographic position. Manchuria, a permanent incubator for such diseases as rinderpest, foot-and-mouth disease and bovine pleuropneumonia, has a 300-mile common border with Korea, and absolute control of traffic across this frontier was impossible even in the police-state of the Japanese regime. Then there is the coastline of over 5,400 miles, along which there are many areas well suited to illicit foreign trade. Small vessels, of the type called "junks", ply the waters of the Yellow Sea and the Sea of Japan. Their cargo is quite varied and often includes such items as hides, furs, bones, and even livestock, all of which are potential spreaders of animal diseases from China, Formosa, Manchuria and elsewhere. Complete control of this traffic has never been accomplished.

Animal disease prevention and control in



Korean technicians bleeding an ox in the production of hyper-immune rinderpest serum, at the National Veterinary Institute, Pusan.

Korea depends largely upon government-sponsored, immunization programs; secondarily upon quarantine and slaughter. The National Veterinary Institute*, located at Pusan, is the source of biological products used in this work. The institute, and its subsidiary at Anyang, also provides what laboratory diagnostic service there is available.

Rinderpest is the most dreaded animal disease in Korea. It has invaded the country on several occasions, its origin usually being traced to Manchuria. Immunization of Korean cattle along the Manchurian border had been practiced annually since 1926. Coupled with traffic restrictions, it proved a successful barrier. However, this system of control broke down at the end of the late war, and, during the last two months of 1945, a project was launched for preventing the entrance of rinderpest into South Korea. The project was given impetus by several rumors that the disease had occurred in Russian-occupied North Korea. Vaccine was used, and all cattle in a zone 10 miles wide, bordering the 38th parallel, were inoculated. Then, in the spring of 1946, the Soviet Commander in North Korea, in an official communication, confirmed the presence of the disease in the north. The

* See, "The National Institute for Veterinary Research in Korea," by Major R. M. Madison, *J. A. V. M. A.*, 109:837. (Dec.) 1946.

immune zone along the 38th-parallel border was broadened to 25 miles during the summer of that year. Simultaneous inoculation with attenuated virus and immune serum was the method used at that time. This program has been repeated annually. Border patrols have been alerted to stop traffic of animals into South Korea, and the Korean Coast Guard cooperates in the effort to eliminate the entrance of northern cattle by boat. Complete control in isolated mountain areas and along the rambling coastline is not feasible, however, and emphasis must continue to be placed upon maintenance of the immune zone. More than 56,000 cattle are inoculated annually in the program.

Foot-and-mouth disease was completely eliminated from Korea in 1934. A small outbreak occurred in 1942, and was controlled the same year by the quarantine-slaughter method. Foot-and-mouth disease vaccine has never been used in Korea. The disease is common in Manchuria and is rumored to have entered North Korea. These rumors have not been confirmed.

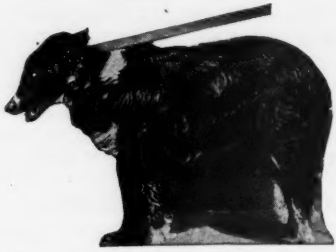
Manchuria was also the source of the last outbreak of bovine contagious pleuropneumonia, which occurred in 1941. It was eradicated by quarantine and slaughter in 1943, and has not been diagnosed in Korea since that time. Anthrax and blackleg are common in certain areas; they are controlled by annual vaccination. Tuberculosis is not found in native Korean cattle, but is common in the few dairy animals. The limited contact between individual animals probably accounts for lack of the disease in the work cattle, although natural resistance may be a contributing factor. The incidence of brucellosis in Korean cattle is unknown.

Horses are of no importance in Korean agriculture, but both the small native pony and the larger western-type animals are commonly used for drayage in urban districts. Glanders and infectious anemia occur sporadically.

Swine erysipelas, pasteurellosis, influenza, and the various types of enteritis are common swine diseases; internal parasitism is almost universal. Hog cholera is occasionally diagnosed by Korean veterinarians, but during the past three years the presence of the disease has not been confirmed, either by the laboratories or in the field investigations of American veterinarians.*

Avian pneumoencephalitis (Newcastle disease) is by far the most important poultry disease and causes large losses. Outbreaks of the disease are controlled by slaughter of infected birds and intravenous inoculation of all fowls in the district with chick-embryo vaccine.

Rabies is a common problem in Korea. Dogs generally receive little attention from their owners, and often roam the countryside in a semiwild state. The plentiful wild fox popu-



The wild fox population makes the problem of rabies control difficult.

lation adds further to the difficulty of rabies control. Relatively large quantities of rabies vaccine are used each year in attempts to control the disease in the most heavily involved areas. But the absence of supportive measures, such as restraint and area-quarantine, usually allows for only partial success in these efforts.

Animal Treatment Service

Treatment of sick or injured animals is probably the weakest part of Korean veterinary medicine. As was previously mentioned, an overwhelming majority of veterinarians are employed by government; the number in private practice is negligible. The farmer, if he needs veterinary service, must go to the county seat and seek the help of the veterinarian employed by the county government. His alternatives are (1) to treat the animal himself, (2) to call in the neighborhood "handyman", of witch-doctor calibre, or (3) to sell the animal for emergency slaughter. He usually chooses one of these alternatives rather than go to the time, expense and trouble of obtaining a veterinarian. It would seem most doubtful that private veterinary practice will ever be successful in Korea. Certainly, the economic plight of the farmer must be eased before he can afford to engage a private veterinarian. Prior to the war's end, the Korean Agriculture Association hired a large number of veterinarians. Farmers were compelled to subscribe to this government-sponsored organization; one of the benefits they received was free veterinary service. This system of quasi-cooperative veterinary service had its advantages. It provided profes-

* Since this was written the diagnosis of hog cholera has been confirmed in Korea. The use of a formalized vaccine is reported to have stopped the outbreak promptly.

sional service that was otherwise lacking, and thus conserved one of the country's important assets — its livestock population. Since private practice is not presently conceivable and since the government may not be expected to afford adequate veterinary treatment service, the cooperative system is perhaps best suited to conditions in Korea. But the only professional curative service now available for farm animals is that provided by government veterinarians.

A TYPICAL KOREAN PIG PEN
Internal parasitism is almost universal in Korean swine

Veterinary Food Inspection

The small number of dairy cattle in South Korea makes dairying an insignificant industry. Dairy animals consist of about 1500 Holsteins; native work cattle are not milked. The small volume of milk produced is marketed in the fluid state and is used chiefly for babies and invalids. There are 37 milk plants scattered through South Korea; they usually have a dairy farm on the same premises. The number of cows at each dairy farm averages about 10, rarely exceeds 20. The operating procedures at both farms and plants are far below recognized Western standards in sanitation. The equipment is old-style, in poor repair and operated by unskilled labor. The milk is processed by sterilization, rather than by pasteurization. Bottling is accomplished by hand into discarded American beer bottles, hand-capped with corks or old beer-bottle caps. The milk is then heated in a steam chamber at 90° C. for 30 minutes. Time controls and thermometers are lacking in most plants. New equipment and essential repair materials are required if minimum standards of milk hygiene are to be attained. All such items must be imported, and the smallness of the dairy industry has precluded granting the necessary priority for their procurement.

Slaughterhouses in South Korea total 715 separate establishments. In general, the buildings are of good construction, following a standard plan; the sizes vary with the size of the town and the local demand for meat. Each building has a concrete killing floor and inspection table. Antemortem examining sheds and other outbuildings are also provided. The disrepair of these abattoirs defeats the possibility of hygienic slaughtering. The establishments are public property, and local governments do not fulfil their responsibility for proper repair and maintenance. Since the county veterinarian is employed by that same local government, there is little he can do in forcing improvements. Consequently, any such changes must be fostered and enforced by the provincial or national levels of veterinary service. The largest abattoir in Korea is the Eastgate Slaughterhouse in Seoul. An eight-month campaign, which included the eventual withdrawal of veterinary inspection and closing of the plant, resulted in a complete renovation of its facilities. This plant now serves as a model for similar reconstruction of the abattoirs throughout South Korea.

A veterinary meat inspection service is provided in only about 50% of the slaughtering establishments. Those which do not operate under veterinary inspection are very small units, the monthly kill in each of which never exceeds a total of 10 animals. The shortage of veterinarians has prevented the provision of inspection for those small outlying establishments. In fact, it is doubtful whether the volume of business conducted in them warrants the expense of proper upkeep. Consideration has been given to plans for more centralized slaughtering, whereby all such operations in a given area might be concentrated in one or two specified abattoirs. The lack of appropriate transportation facilities and the encouragement such an arrangement would give to clandestine slaughtering, have delayed adoption of the scheme.

Conclusion

Veterinary medicine in Korea is nationalized. Practically all veterinarians are employed by the government. As might be expected under such a system, disease prevention and control are far more developed than curative veterinary medicine. By western standards, Korean veterinary service is inadequate. But the Korean people are gradually becoming more appreciative of it and there is every reason to expect definite improvement in their veterinary service through influence of the new College of Veterinary Medicine and a more conscientious leadership within government veterinary agencies.

Veterinary Medicinal Preparations as Viewed by the Food and Drug Administration*

By H. E. MOSKEY, V.M.D.†
Washington, D. C.

THE provisions of the federal Food, Drug, and Cosmetic Act are applicable only to interstate shipments of foods, drugs, devices, etc. for man or other animals. The Act contains no provision dealing solely with the advertising of foods, drugs, devices, etc.; a special federal statute dealing with the advertising of foods, drugs, devices, etc. is enforced by the Federal Trade Commission. However, under some circumstances, advertising may constitute labeling which is subject to the Food, Drug, and Cosmetic Act. The use of mails for fraudulent purposes is prohibited by the Post Office Department. The Food and Drug Administration actively cooperates with the Post Office Department and the Federal Trade Commission on questions dealing with foods, drugs, devices, etc., for man or other animals.

Briefly, the federal Food, Drug, and Cosmetic Act requires the labeling of drugs to bear a conspicuous declaration of the quantity of contents in the container of the article; a declaration of the active ingredients by their common or usual names including the quantities or proportions of certain specified drugs; adequate directions for the safe and intelligent use of the article; and adequate warnings against misuse. In order that the directions may be adequate the labeling must indicate the specific purpose for which the preparation is to be used. In the absence of any indication of purpose the directions cannot be regarded as adequate. If adequate directions cannot be prepared for use of the drug safely by laymen, its sale or distribution is restricted to physicians, dentists, or veterinarians for use in their practice or to pharmacists for filling prescriptions. In such cases the regulations provide for certain requirements with which the label must comply. The label must not bear any indications for use or any directions except for parenteral preparations. The label must declare the quantity or proportion of each active ingredient and provide any warnings that may be necessary. The label must also bear the following legend: "To be dispensed only by or on the prescription of a physician, dentist or veterinarian (as the case may be) or otherwise used for manufacturing purposes."

The Administration is not fostering restrictions of over-the-counter sale of veterinary medicinal preparations to the same extent that it fosters restrictions of sales of medicinal preparations for human use. The propriety of such sales, however, depends entirely on whether or not adequate directions can be prepared to enable livestock and poultry raisers to treat their own animals safely and intelligently with the drug purchased. It seems highly probable, therefore, that the labeling of potent drugs for veterinary use should bear a forthright statement to the effect that the safe and efficacious use of such products as directed depends upon an adequate diagnosis obtained from a qualified diagnostic laboratory or practicing veterinarian.

One of the most practical ways to administer drugs to a large group of animals or fowls is to mix them thoroughly in the feed. Many interested manufacturers of livestock and poultry feeds have now placed on the market feed mixtures containing active drug ingredients. In our opinion such mixtures come under the definition of a "drug" and must comply with the drug provisions of the Act. The feed ingredients, under the circumstances, must be regarded only as the vehicle or carrying agent for the drug and may be declared as such in compliance with the state feed laws.

Because of the great progress made within the last few years in the field of chemotherapy, both human and veterinary, many new therapeutic agents have been developed most of which fall within the definition of the term "new drug" as defined by the Act. A new drug cannot be marketed legally in interstate channels until a new-drug application with respect to it becomes effective as provided for by the Act. The Act provides for the promulgation of regulations exempting from the operations of the new-drug provisions of the Act drugs intended solely for investigational use by experts qualified by scientific training and experience to investigate the safety of drugs. A new-drug application cannot be considered complete for filing with the Administrator for consideration unless it is accompanied by sufficient experimental data to show that the drug, when used as directed for the specific purpose for which it is intended, is safe. In addition, a new-drug application must furnish a full descrip-

* Presented at the Veterinary Short Course, University of Minnesota, University Farm, Oct. 27, 1948.
† Chief, Veterinary Medical Section, Food and Drug Administration, Federal Security Agency.

tion of the methods used in, and the facilities and controls used for, the manufacture, processing and packaging of the drug. To submit a complete application the manufacturer must be in a position to show that he employs adequate laboratory facilities to insure proper identity, strength, and purity of the raw materials in each batch of the finished product.

The competition in manufacturing and selling drug products for veterinary use is getting greater all the time and our attention is constantly being called to the questionable practices of some manufacturers or distributors in this field. In the enforcement of the law we are proceeding as rapidly as possible with our limited funds and veterinary medical personnel against many of the questionable types of veterinary products on the market. Most of our problems involve poultry, swine, cattle, and sheep remedies. We have been active in this field and many of our cases have been contested in the federal courts. Many of our seizure actions and criminal prosecutions are not contested. When they are contested the Food and Drug Administration must have the support and help of outstanding authorities on diseases of animals. Our legal advisors do not believe that we should rely solely on the testimony of scientists in the employ of the Federal Government. This means that we must rely on the cooperation and help of outstanding veterinary authorities connected with state institutions, particularly of the state in which the case is to be tried and of nearby states.

In many of our cases it is necessary to have some factual evidence developed by scientists other than those connected with the Food and Drug Administration. We have experienced a great deal of difficulty in obtaining such factual evidence from federal and state institutions which have the personnel and facilities for carrying out investigational or research work with diseases of poultry and other animals. Unless we can develop a better cooperation in this field we cannot effectively remove many of the worthless remedies now on the market.

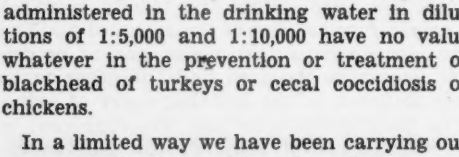
In cooperation with the College of Veterinary Medicine, University of Illinois, we have succeeded in developing some factual information to show that so-called alkaline mixtures with and without nicotinic acid for hogs have no demonstrable value for so-called field cases of necrotic enteritis of swine. Unfortunately, animal nutritionists in their studies of nicotinic acid deficiency in swine associated the symptoms produced in pigs by a feed totally deficient in nicotinic acid with the disease commonly known as necrotic enteritis. It is now generally conceded that it would have been more appropriate to associate the symptoms with pig pellagra. One recent criminal case tried before the federal court at Chicago involved two of the so-called alkaline necrotic enteritis treatments, one to be administered in the feed and the other to be administered in the drinking water of swine. The Government's position was supported by the testimony of some of the outstanding Midwestern veterinary medical authorities on diseases of swine. These authorities testified to the effect that enteritis or necrotic enteritis is a symptom which may be associated with many causes, including faulty feeding, and is not a specific disease entity in itself. This testimony brought out that necrotic enteritis is frequently a symptom of hog cholera and *Salmonella choleraesuis* infection and that it may be a symptom also of the disease commonly known as black scours or bloody dysentery of swine. All of the expert witnesses who testified for the Government agreed that it may be a symptom of faulty feeding which probably involves nutritional problems other than nicotinic acid deficiency. In view of the facts before us, we do not believe there is any one remedy that would be effective for the prevention and treatment of necrotic enteritis associated with various causes.

The Michigan State College, School of Veterinary Medicine has also been very co-operative in developing some factual evidence with respect to several types of poultry remedies, particularly with those products containing so-called intestinal astringent drugs and coccidiosis remedies. There is ample evidence that many astringent drugs do possess astringent properties when applied directly to mucous membranes. Some of these drugs are referred to in textbooks as intestinal astringents. We have taken the stand in the enforcement of the law that such drugs, when taken internally in safe dosages, do not exert any astringent effect in the intestinal tract. This opinion was formed after some of our histological studies in which tissues taken from various portions of the digestive tract of treated birds were compared with untreated birds.

A published article, based on experimental work, developed considerable interest recently in quaternary ammonium compounds to be added to poultry drinking water and feed for the prevention and treatment of diseases of poultry. In the enforcement of the law, through the cooperation of the Zoological Division of the Bureau of Animal Industry and the University of Illinois, we have completed

some controlled tests with one of these compounds in the dilutions of 1:5,000 and 1:10,000. The tests conclusively proved to our satisfaction that quaternary ammonium compounds administered in the drinking water in dilutions of 1:5,000 and 1:10,000 have no value whatever in the prevention or treatment of blackhead of turkeys or cecal coccidiosis of chickens.

In a limited way we have been carrying out some investigations with a few of the many



Many million dollars are spent annually by poultry raisers for inhalant sprays in an effort to control respiratory diseases in flocks. Projects for investigating the value of such sprays, should be worthwhile.

so-called poultry tonics which are appearing on the market. These investigations were carried out under controlled conditions with normal chickens and with chickens recovering from cecal coccidiosis. By comparing the body weight, feed and water consumption we have been unable to demonstrate any beneficial effect from the use of the tonic preparations under investigation. Recently we have completed an investigation of an irrational mixture represented as a tonic for poultry and as a treatment for Monelia infections in chickens. According to the manufacturer, the product contains copper sulfate, and when used as directed in the feed, it furnishes an amount comparable to that recommended in the textbook entitled "Diseases of Poultry" published by the Iowa State College Press. The product is also represented as a fungicide to control mold in the feed. Our fungicidal tests showed that the product when mixed in the feed as directed had no value whatever against growth of the usual types of mold found in feeds. Using chickens experimentally infected with *Monelia albicans* under controlled conditions, the tests showed that the product had no value whatever in treating infected chickens. Our tonic tests with normal chickens showed that the rate of growth was decreased, apparently a result of a decrease in the utilization of the treated feed.

Many millions of dollars are spent annually by poultry raisers for inhalant sprays, in attempt to control outbreaks of respiratory diseases in poultry flocks. We believe it would be worthwhile, from the standpoint of benefits to poultry raisers, if some of the scientific institutions would inaugurate projects for carrying out some investigational work with some of these inhalant sprays to determine definitely whether the use of such preparations serves such purpose.

Information of a questionable nature dealing with the relation of vitamin E to reproduction has led many livestock raisers to believe that wheat germ oil, a source of vitamin E, has value in correcting breeding difficulties and sterility of livestock. There is now ample scientific evidence that vitamin E has no relation to reproduction in livestock. We have little doubt that the vitamin may be an essential nutritional requirement. However, it is our understanding that most feeds for livestock furnish an ample supply of this vitamin for nutritional purposes. Those manufacturers who wish to perpetuate the sale of wheat germ oil now claim that wheat germ oil may contain factors other than vitamin E which play an important part in the prevention and treatment of breeding difficulties, sterility, and abortion. One manufacturer of wheat germ oil is even claiming that his product will prevent and cure brucellosis of cattle. Unfortunately, some of our livestock breeders and practicing veterinarians have been impressed with the theories advanced by the manufacturer which he claims are based on scientific evidence. As far as we have been able to determine, this so-called scientific evidence consists largely of statements from satisfied users and others who do not have a thorough knowledge of the numerous causal factors and pathological conditions associated with failure to conceive and abortions in the female and sterility in both males and females. The Food and Drug Administration has seized several large shipments of wheat germ oil under labeling which the Government alleged bore false and misleading claims. At present we are preparing to take criminal action against a manufacturer who apparently desires to have the whole issue settled by a trial before the federal court.

The federal Food, Drug, and Cosmetic Act has been amended to require certification of each batch of penicillin and streptomycin manufactured before it can be distributed or sold in interstate commerce. Streptomycin

and especially penicillin as an udder infusion for the treatment of mastitis of cattle due to *Streptococcus agalactiae,* are now being used in veterinary medicine. Ten per cent, or more of bovine mastitis cases are caused by staphylococci, corynebacteria, and colon organisms. Unfortunately, some of these causes do not respond satisfactorily to penicillin therapy or for that matter to any known therapy. However, it is agreed among research workers that *Streptococcus agalactiae,* which does yield to penicillin therapy, is the cause of most cases of mastitis of dairy cows. On October 5, 1945, the Administration issued a notice to manufacturers and distributors of veterinary penicillin furnishing indications, directions, and precautions suggested for inclusion in the labeling of penicillin for veterinary use. On April 25, 1946, this notice was supplemented by some additional information based on recent advances in the treatment of mastitis of cattle caused by *Streptococcus agalactiae.*

Recently there has been a tendency on the part of some research workers to recommend a large number of units of penicillin in each injection, with a reduced number of treatments. For example, large udders may receive three daily injections consisting of 200,000, 100,000 and 100,000 units of penicillin respectively. Infected quarters of small to moderate sized udders may receive three daily injections consisting of 100,000, 50,000 and 50,000 units respectively. During the dry period, up to three weeks before parturition, each quarter infected with *Streptococcus agalactiae* may be infused with 100,000 to 200,000 units of penicillin in a single treatment. The only reliable criterion for determining whether the treatment has been effective or not is a bacteriological examination of the milk taken from the infected quarter after the treatment. Aqueous and saline suspensions of penicillin for intramuscular use in systemic infections caused by penicillin-sensitive organisms have not been popular with practicing veterinarians, with the possible exception of some small-animal practitioners, because it is not convenient or economically feasible to make the injections at three-hour or four-hour intervals to maintain adequate therapeutic blood levels. With the development of penicillin in oil and wax, and recently procaine penicillin, both of which maintain satisfactory blood levels over a period of 24 hours or more from one adequate injection, and with considerably lower costs resulting from improved methods of production, the interest of practicing veterinarians in these forms of the drug has increased tremendously. Recognition must be given to the fact that therapeutically effective blood levels, being influenced by many factors, cannot be determined by any rule of thumb. Adequate penicillin dosage and duration of treatment will vary from one patient to another depending on the organism involved, its

In the treatment of streptococcic mastitis a minimum of about 2,000 units of penicillin per pound of body weight is required to maintain a blood level which may be regarded as therapeutically effective.

relative sensitivity to penicillin, the severity and stage of the infection, and the age and general condition of the patient. On the basis of the most reliable information available at the present moment, a minimum of 2,000 units of penicillin per pound of body weight is required to establish and maintain an approximate 0.03 unit per cubic centimeter blood level which generally may be regarded as therapeutically effective, for conditions caused by most strains of the more susceptible organisms.

With respect to sulfonamides as a whole it is generally believed that systemic infections caused by organisms susceptible to sulfonamide therapy require a dose of 1 to 1.5 grains of sulfonamide per pound of body weight. Some of the newer sulfonamides, particularly those with the pyrimidine ring such as sulfamerazine and sulfamethazine, maintain an adequate blood level with this dosage for 12 hours or longer. At the present time it appears that sulfonamide therapy in veterinary medicine has a much wider range than penicillin therapy but sulfonamides are far more toxic and their use requires a more careful observation of the animal.

Last but not least, let me point out that the veterinary faculty of the University of Minnesota has been very helpful to the Food and Drug Administration in rendering expert testimony in some of our important court cases involving misbranded veterinary medicinal preparations. We hope that this fine spirit of cooperation will continue in the protection of our livestock and poultry raisers.

Serum Level Response of Horses to Procaine Penicillin in Oil and Penicillin in Oil and Wax*†

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THE frequency of injections required to maintain therapeutically effective levels of penicillin in the blood has been the major disadvantage of penicillin therapy in veterinary practice. The use of oil and wax vehicles has reduced the frequency of injections required for treatment, but the blood-level response following their use has been erratic. Undesirable local tissue reactions have also been experienced with penicillin in oil and wax preparations. Sullivan and associates[1] have described use of a new crystalline penicillin complex produced by chemically combining procaine with penicillin G. By suspending this penicillin complex in cottonseed oil, they were able to obtain blood levels of 0.062 or more unit/ml at 24 hours after injection in 16 of 17 human patients with doses of 300,000 units. Because of the apparent superiority of this form of penicillin, the investigation reported here was made to compare the duration of serum levels produced in horses by procaine penicillin and by penicillin in oil and wax.

Methods

Four penicillin preparations were used in this study. The procaine penicillin was labeled "procaine penicillin G suspended in sesame oil containing 300,000 units/ml." Three preparations of penicillin in oil and wax were used: amorphous calcium penicillin suspended in peanut oil containing 4.8% white wax U.S.P. 300,000 units/ml, potassium crystalline penicillin G suspended in peanut oil containing 4.8% white wax U.S.P. 300.000 units/ml, and sodium crystalline penicillin G suspended in peanut oil containing 4.8% white wax U.S.P. 300,000 units per/ml.

The horses used were apparently normal and had free access to feed and water throughout the test periods. Penicillin doses were measured as accurately as possible in glass syringes and the entire dose was injected at one site in the musculature of the neck. Blood samples for assay were obtained from the jugular vein at the first and third hours following injection and at 3-hour intervals thereafter. The method of assay was the serial dilution procedure previously reported by Doll and Dimock.[2]

Doses of 1000 Units Per Pound of Body Weight

With procaine penicillin in oil, the duration of the measurable serum level varied from nine to 21 hours. Measurable concentrations were obtained for nine hours in two trials, 12 hours in one trial, 15 hours in four trials and 21 hours in one trial.

Variation in the rate of absorption was indicated by higher serum concentrations during the first six hours in two trials with measurable levels persisting for nine hours and in one trial with a duration of 12 hours. Twofold to fourfold variation in serum concentrations for different animals at corresponding test intervals occurred throughout the assay period. The average duration of the detectable serum level period was approximately 14 hours. Table I.

The three forms of penicillin in oil and wax will be discussed as a group, since variations in the serum levels are considered to be due to the physical nature of the preparations rather than the form of penicillin employed. Extreme variation was obtained in both the duration and concentration of the serum level response. Duration of the measurable serum concentrations was three hours in three trials, six hours in four trials, nine hours in four trials and 12 hours in one trial. Variations in serum concentration of penicillin ranging from four to 16-fold were obtained at respective test intervals throughout the assay period. In some trials the height and duration of the serum levels were comparable to those obtained from aqueous solutions.[3] The average duration of the measurable serum level was approximately seven hours. Table II.

In this comparison the performance of penicillin in oil and wax was definitely inferior to that of procaine penicillin in oil. With the penicillin in oil and wax, the serum level response was far more erratic and the average duration of the detectable level was

*The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the director.

†The penicillin used in this study was supplied for investigational use by Schenley Laboratories, Inc., New York City, New York.

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TABLE I.—PROCAINE PENICILLIN, 1000 UNITS PER POUND OF BODY WEIGHT, INTRAMUSCULARLY

Weight (pounds)	Total dose (units)	Unit/ml of serum at specified hours following injection								
		1	3	6	9	12	15	18	21	24
590	590,000	0.16	0.32	0.16	0.16	0.08	0.02	0.00	0.00	0.00
510	510,000	0.08	0.16	0.16	0.08	0.04	0.02	0.00	0.00	0.00
570	570,000	0.16	0.16	0.08	0.08	0.02	0.02	0.00	0.00	0.00
560	560,000	0.32	0.64	0.32	0.16	0.04	0.00	0.00	0.00	0.00
240	240,000	0.32	0.64	0.16	0.08	0.00	0.00	0.00	0.00	0.00
220	220,000	0.08	0.16	0.16	0.16	0.08	0.08	0.04	0.02	0.00
165	165,000	0.16	0.32	0.32	0.08	0.00	0.00	0.00	0.00	0.00
200	200,000	0.16	0.16	0.16	0.16	0.08	0.02	0.00	0.00	0.00

approximately only one-half that obtained with procaine penicillin in oil. Performance of the oil and wax preparations was inferior to that obtained in a previous study on the Romansky formula, wherein doses of 1000 units/lb maintained measurable serum levels for an average duration of 10 hours with twofold to eightfold variations in the serum concentration of penicillin at corresponding assay intervals for different subjects.[4]

Doses of 2000 Units Per Pound of Body Weight

Using procaine penicillin in oil, the duration of the detectable serum level was 18 hours in two trials, 21 hours in three trials and 24 hours in three trials, when 2000 units/lb were given. The variation in the duration of the measurable serum level period was not as great as with doses of 1000 units/lb. It is probable, however, that greater differences in duration of the measurable level would have occurred with extension of the assay period. The serum concentrations of penicillin varied from twofold to fourfold at corresponding assay periods for different horses during the first 15 hours following injection. Eightfold variation in serum concentrations occurred in the 18, 21 and 24-hour periods. The average duration of the measurable serum level period was about 20 hours. Table III.

TABLE II.—SERUM LEVELS FOLLOWING SINGLE INTRAMUSCULAR INJECTION OF PENICILLIN IN OIL AND WAX; 1000 UNITS PER POUND OF BODY WEIGHT

Material	Weight (pounds)	Dose (units)	Units/ml of serum at specified hours following injection					
			1	3	6	9	12	15
Ca	600	600,000	0.32	1.28	0.08	0.00	0.00	0.00
Ca	520	520,000	0.32	0.64	0.16	0.015	0.00	0.00
Ca	280	280,000	0.16	0.16	0.32	0.16	0.04	0.00
Ca	310	310,000	0.32	0.64	0.08	0.00	0.00	0.00
K	580	580,000	0.64	0.64	0.32	0.04	0.00	0.00
K	570	570,000	0.64	0.64	0.32	0.04	0.00	0.00
K	320	320,000	0.32	0.64	0.16	0.08	0.00	0.00
K	260	260,000	1.28	1.28	0.08	0.00	0.00	0.00
Na	920	920,000	2.56	0.64	0.00	0.00	0.00	0.00
Na	850	850,000	1.28	0.64	0.08	0.00	0.00	0.00
Na	180	180,000	0.64	0.08	0.00	0.00	0.00	0.00
Na	240	240,000	1.28	0.64	0.00	0.00	0.00	0.00

With penicillin in oil and wax, a detectable quantity of penicillin was present in the serum at six hours following injection in nine trials, at nine hours in six trials and at 24 hours in one trial. Omitting the trial in which the detectable level persisted for 24 hours, the average duration was approximately seven hours. Absorption of penicillin from the oil and wax was extremely erratic, with 64-fold differences in serum concentration at the first hour following injection. Differences of four and 32-fold in serum concentration of penicillin occurred at the

Ca—Penicillin calcium in peanut oil containing 4.8% W/V white wax U.S.P., 300,000 units/ml.
K —Potassium crystalline penicillin G in peanut oil containing 4.8% W/V white wax U.S.P., 300,000 units/ml.
Na—Sodium crystalline penicillin G in peanut oil containing 4.8% W/V white wax U.S.P., 300,000 units/ml.
Pr.—Procaine penicillin G suspended in sesame oil, 300,000 units/ml.

3rd and 6th hours respectively. Table IV.

Performance of the penicillin in oil and wax preparations used in this study was inferior to that experienced in an earlier investigation, in which the average duration of the measurable serum level was approximately 15 hours and absorption was more regular.[4] Some serum level responses obtained in the present investigation were not superior in either height or duration to those obtained in a previous study with aqueous solutions.[3]

Superiority in performance with procaine penicillin in oil over that obtained with penicillin in oil and wax is evident in both duration of the measurable serum level and in the regularity of absorption from the intramuscular depot. The average duration of the measurable serum level period was approximately three times longer with the procaine penicillin in oil.

TABLE III.—PROCAINE PENICILLIN, 2000 UNITS PER POUND OF BODY WEIGHT, INTRAMUSCULARLY

Weight (pounds)	Total dose (units)	Units per ml of serum at specified hours following injection								
		1	3	6	9	12	15	18	21	24
590	1,180,000	0.64	1.28	0.64	0.32	0.16	0.04	0.02	0.00	0.00
510	1,020,000	0.64	1.28	0.64	0.32	0.16	0.08	0.02	0.00	0.00
570	1,140,000	0.64	0.64	0.32	0.32	0.16	0.04	0.02	0.02	0.00
560	1,120,000	0.64	0.64	0.64	0.32	0.16	0.16	0.08	0.04	0.00
300	600,000	0.64	0.64	0.64	0.32	0.32	0.16	0.08	0.04	0.02
245	490,000	0.32	0.32	0.32	0.16	0.16	0.16	0.16	0.16	0.16
270	540,000	0.32	0.32	0.64	0.32	0.32	0.16	0.16	0.08	0.08
285	570,000	0.64	0.64	0.32	0.32	0.16	0.08	0.08	0.02	0.00

TABLE IV.—SERUM LEVELS FOLLOWING SINGLE INTRAMUSCULAR INJECTION OF PENICILLIN IN OIL AND WAX; 2000 UNITS PER POUND OF BODY WEIGHT

Material	Weight (pounds)	Dose (units)	Units/ml of serum at specified hours following injection								
			1	3	6	9	12	15	18	21	24
Ca	250	500,000	0.32	1.28	0.64	0.08	0.00	0.00	-	-	-
Ca	210	420,000	0.08	0.64	0.04	0.16	0.00	0.00	-	-	-
Ca	170	340,000	0.16	0.64	0.08	0.08	0.00	0.00	-	-	-
Ca	230	460,000	0.64	1.28	0.32	0.00	0.00	0.00	-	-	-
K	240	480,000	0.64	1.28	1.28	0.015	0.00	0.00	-	-	-
K	210	420,000	2.56	2.56	0.08	0.00	0.00	0.00	-	-	-
K	130	260,000	2.56	1.28	0.16	0.00	0.00	0.00	-	-	-
K	230	460,000	0.64	1.28	0.32	0.00	0.00	0.00	-	-	-
Na	920	1,840,000	0.32	0.64	0.64	0.32	0.16	0.32	0.08	0.04	0.015
Na	180	360,000	1.28	0.64	0.08	0.04	0.00	0.00	0.00	0.00	0.00
Na	850	1,700,000	5.12	1.28	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Na	240	480,000	5.12	1.28	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Na	920	1,840,000	5.12	2.56	0.16	0.00	0.00	0.00	0.00	0.00	0.00
Na	240	480,000	5.12	0.64	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Na	915	1,830,000	5.12	1.28	0.16	0.08	0.00	0.00	0.00	0.00	0.00
Na	310	620,000	5.12	1.28	0.04	0.00	0.00	0.00	0.00	0.00	0.00

Doses of 4000 Units Per Pound of Body Weight

With procaine penicillin in oil, measurable serum concentrations were present at each assay interval throughout the 24 hour test period in all subjects. As indicated by height of the serum concentrations, absorption was somewhat variable with fourfold to eightfold variations at corresponding assay periods for different horses. Table V.

Using penicillin in oil and wax, measurable serum levels were maintained for six hours in two trials, nine hours in seven trials, 12 hours in two trials and 15 hours in four trials. Table VI. Absorption of penicillin from the oil and wax suspension was apparently quite erratic, with variations of twofold to 64-fold in serum levels of different animals at corresponding assay periods. The average duration of the measurable serum level period was approximately 10 hours. The serum levels obtained in some trials were comparable to

TABLE V.—PROCAINE PENICILLIN, 4000 UNITS PER POUND OF BODY WEIGHT, INTRAMUSCULARLY

Weight (pounds)	Total dose (units)	Units per ml of serum at specified hours following injection								
		1	3	6	9	12	15	18	21	24
590	2,360,000	0.64	0.64	1.28	1.28	0.64	0.64	0.32	0.32	0.16
510	2,040,000	0.32	0.64	0.64	0.32	0.32	0.16	0.16	0.16	0.16
570	2,280,000	0.32	0.32	0.32	0.32	0.32	0.16	0.08	0.08	0.08
560	2,240,000	0.64	0.64	0.64	0.64	0.64	0.32	0.32	0.16	0.16
240	960,000	0.64	0.64	0.64	0.64	0.32	0.16	0.16	0.08	0.08
220	880,000	0.64	0.64	0.64	0.64	0.32	0.32	0.16	0.08	0.08
165	660,000	0.64	0.64	0.64	0.64	0.32	0.16	0.08	0.04	0.04
200	800,000	0.16	0.16	0.16	0.16	0.16	0.08	0.08	0.04	0.02

TABLE VI.—SERUM LEVELS FOLLOWING SINGLE INTRAMUSCULAR INJECTION OF PENICILLIN IN OIL AND WAX; 4000 UNITS PER POUND OF BODY WEIGHT

Material	Weight (pounds)	Dose (units)	Units/ml of serum at specified hours following injection								
			1	3	6	9	12	15	18	21	24
Ca	250	1,000,000	5.12	1.28	0.64	0.02	0.00	0.00	0.00	0.00	0.00
Ca	210	840,000	10.24	2.56	0.32	0.04	0.00	0.00	0.00	0.00	0.00
Ca	170	680,000	2.56	0.64	0.16	0.00	0.00	0.00	0.00	0.00	0.00
Ca	230	920,000	1.28	5.12	0.64	0.08	0.00	0.00	0.00	0.00	0.00
K	240	960,000	5.12	5.12	0.64	0.08	0.00	0.00	0.00	0.00	0.00
K	210	840,000	2.56	5.12	0.64	0.08	0.00	0.00	0.00	0.00	0.00
K	130	520,000	5.12	1.28	0.32	0.02	0.015	0.00	0.00	0.00	0.00
K	230	920,000	1.28	5.12	0.64	0.08	0.00	0.00	0.00	0.00	0.00
Na	600	2,400,000	5.12	2.56	1.28	0.32	0.08	0.04	0.00	0.00	0.00
Na	520	2,080,000	5.12	5.12	0.64	0.32	0.04	0.015	0.00	0.00	0.00
Na	580	2,320,000	10.24	1.28	0.32	0.16	0.08	0.04	0.00	0.00	0.00
Na	320	1,280,000	10.24	2.56	0.32	0.08	0.00	0.00	0.00	0.00	0.00
Na	260	1,040,000	2.56	2.56	1.28	0.64	0.08	0.02	0.00	0.00	0.00
Na	215	860,000	0.64	2.56	0.32	0.08	0.02	0.00	0.00	0.00	0.00
Na	280	1,120,000	5.12	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.00

those obtained in a previous study using doses of 2000 units/lb in aqueous solution.[3] Performance of the oil and wax preparations used in this study was inferior to that of a Romansky formula preparation studied previously, which maintained measurable serum injection. The average serum concentrations for the procaine penicillin were approximately equal to or exceeded those of the penicillin in oil and wax at six hours following injection, and from this point continued at higher levels throughout the assay periods. With

TABLE VII.—SERUM LEVEL AVERAGES FOR THE DIFFERENT FORMS AND DOSES OF PENICILLIN

Material	Number of Trials	Dose in units/lb of body weight	Units/ml of serum at specified hours following injection								
			1	3	6	9	12	15	18	21	24
Ca	4	1000	0.28	0.68	0.16	0.04	0.01	0.00	-	-	-
Na	4	1000	1.44	0.50	0.20	0.00	0.00	0.00	-	-	-
K	4	1000	0.72	0.80	0.22	0.08	0.00	0.00	-	-	-
Pr.	8	1000	0.18	0.32	0.19	0.12	0.04	0.02	0.005	0.002	0.00
Ca	4	2000	0.30	0.96	0.27	0.08	0.00	0.00	-	-	-
Na*	8	2000	4.40	1.20	0.15	0.05	0.02	0.04	0.01	0.001	0.00
K	4	2000	1.60	1.60	0.46	0.003	0.00	0.00	-	-	-
Pr.	8	2000	0.56	0.72	0.52	0.32	0.20	0.11	0.07	0.04	0.03
Ca	4	4000	4.80	2.40	0.44	0.03	0.00	0.00	0.00	0.00	0.00
Na	7	4000	5.43	2.40	0.59	0.23	0.04	0.016	0.00	0.00	0.00
K	4	4000	3.52	4.16	0.56	0.06	0.003	0.00	0.00	0.00	0.00
Pr.	8	4000	0.50	0.54	0.62	0.58	0.38	0.25	0.17	0.12	0.09

* Only one determination of this group had a duration exceeding 12 hours.

levels for 24 hours in seven trials and 21 hours in one trial.[4] The duration of serum concentrations of therapeutic significance with the penicillin in oil and wax used in this study was less than one-half that obtained with procaine penicillin in oil.

Discussion

A summary of the average serum concentrations obtained with the various penicillin preparations is presented in table VII. It appears that the penicillin in oil and wax preparations is absorbed erratically, and that wide variations in duration and height of the serum level response may be expected with different products, and in different subjects with a single lot of the material. Apparently there was no consistent increase in either height or duration of the serum level response as doses of the penicillin in oil and wax were increased.

The procaine penicillin was characterized by slower and more uniform absorption resulting in prolongation of the serum level response. The height of the average serum levels was uniformly lower for the procaine penicillin than for the penicillin in oil and wax during the first three hours following penicillin in oil and wax the duration of the serum level response varied from three to 12 hours with doses of 1000 units/lb, from six to nine hours with doses of 2000 units/lb except for one determination persisting for 24 hours, and from six to 14 hours with doses of 4000 units/lb. With procaine penicillin in oil, the serum level response varied from nine to 21 hours with doses of 1000 units/lb, from 18 to 24 hours with doses of 2000 units/lb and was 24 hours in all trials with doses of 4000 units/lb (Table VIII). In comparing the recession of the serum level responses to procaine penicillin in different subjects (Tables I, III and V) is appears that measurable quantities of penicillin would have persisted for some time after 24 hours in most of the trials with 4000 units/lb and in two trials with 2000 units/lb. For the penicillin in oil and wax, the average duration of the serum level response was seven, seven, and 10 hours respectively for doses of 1000, 2000, and 4000 units/lb of body weight. For the procaine penicillin in oil the average duration of the serum level response was 14 and 20 hours respectively for doses of 1000 and 2000 units/lb. Therapeutically significant serum concentra-

tions were present in all trials at 24 hours with doses of 4000 units/lb. Table VIII.

For therapeutic use it appears that with procaine penicillin in oil, dosage of 1000 units/lb at 12-hour intervals would in most cases maintain active concentrations of penicillin in the blood. With doses of 2000 units/lb, the serum level response was such that injection intervals of 24 hours would probably be satisfactory for clinical use. Doses of 4000 units/lb at 24-hour intervals should maintain therapeutically active serum concentrations. The average serum level responses with doses of 2000 and 4000 units/lb were not greatly different during the first six hours of the assay periods and showed less than 50% variation at the ninth and twelfth hour periods. This suggests that more uniform serum levels might result from doses of 2000 units/lb at 12-hour intervals than from 4000 units/lb doses at 24-hour intervals. Significant irritation of the tissues has not occurred with the procaine penicillin in oil.

TABLE VIII.—DURATION OF SERUM LEVELS WITH PROCAINE PENICILLIN AND PENICILLIN IN OIL AND WAX

Preparation of Penicillin	Duration in hours of serum level of detectable quantities of penicillin					
	1000 units/lb.		2000 units/lb.		4000 units/lb.	
	Variation	Average	Variation	Average	Variation	Average
Oil and Wax Calcium Potassium Sodium	3-12	7	6-24	7*	6-14	10
Procaine	9-21	14	18-24*	20	-	24**

* 24 hour duration in only one case — omitted from average. ** 24 hours end of all trial runs.

Summary

Data on the serum level response of horses to various doses of procaine penicillin in oil and penicillin in oil and wax are presented.

The findings appear to justify the conclusion that procaine penicillin in oil is definitely superior to penicillin in oil and wax for maintaining measurable quantities of penicillin in the blood. Absorption from the intramuscular depot with procaine penicillin in oil has been slower and more uniform, thereby maintaining measurable serum levels two to three times as long as equal doses of penicillin in oil and wax. Local tissue reactions occurring with penicillin in oil and wax have not been experienced with procaine penicillin in oil.

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Control of Pneumonia in Cattle with Sulfamethazine*

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THIS report deals with the clinical use of sulfamethazine in pneumonia in both calves and adult cattle. Various sulfonamides have been used in the treatment of this disease, and Roberts and Kiesel[1] reported that, since sulfonamide therapy has come into general use, mortality from pneumonia has been markedly reduced. They compared the mortality figures in animals treated at the New York State Veterinary College ambulatory clinic during the 10 years preceding sulfonamide therapy and during the period following. From 1927 to 1937, the mortality rate was 21.4%, from 1937 to 1945, 9.4%, and for 1945 and 1946, only 4.6%. During these latter years, the more effective drugs, sulfamethazine and sulfamerazine, were used in 119 of the total of 190 cases treated.

Thorp[2] reported favorable results following the use of sulfathiazole, sulfadiazine, and sulfamerazine in the treatment of calf pneumonia early in the disease. In controlled experiments, using sulfathiazole, sulfapyridine, and sulfadiazine in the treatment of clinical cases of calf pneumonia, Jones[3] found that sulfonamide therapy decreased the percentage of mortality in comparison with the controls, but the differences between the three drug groups were too small to be statistically significant. Sulfamerazine was used in the treatment of pneumonia in both calves and adult cattle by McAuliff[4]. He recommended an initial daily dose of 1.5 grains per pound of body weight, given in equal portions at eight-hour intervals, followed by 0.5 grain per pound body weight per day in two equal daily doses. He reported a recovery rate of 95% in the treatment of adult cattle, and 93% in calves. Thorp[5] stated that, in a limited number of cases of calf pneumonia treated, sulfamethazine was found highly effective. He found, however, that, as with other sulfonamides, treatment started when there was considerable lung involvement resulted in slow recovery or death.

Calf Pneumonia

All clinical cases of pneumonia occurred in a purebred Jersey herd. Calves were stabled in individual pens in calf barns up to three months of age. At that time, they were placed together in large pens, where there was close confinement and, at times, inadequate ventilation and fluctuating temperature. Usually there were 45 to 65 calves in the barn, about three to six months of age. In the early winter, pneumonia became a problem under these circumstances, and quickly spread by contact.

* From Biltmore Dairy Farms, Biltmore, N. Carolina.

Diagnosis

All diagnoses were made by physical examination. The animals exhibited the typical symptoms of inappetence, temperatures up to 106° to 106.5°F., rapid labored breathing, cough, nasal discharge, and varying degrees of lung involvement. There was no diarrhea in any of these cases.

Necropsies were performed to check clinical diagnoses. Although no bacteriological work was done, in my opinion the gross lesions were typical of acute bacterial pneumonia—pasteurellosis. Whether or not there was complication with virus disease is not known.

Treatment and Results

Powdered sulfamethazine was placed in gelatin capsules for oral administration and a 25% sterile solution of the sodium salt was used for parenteral administration. Chart 1 gives a summary of treatment and results. In early treatment procedures, various dosages and routes of administration were tried. In four calves weighing approximately 150 pounds, typical symptoms were apparent and temperatures ranged from 104.3° to 106°F. A dosage of one grain per pound of body weight was administered orally, once daily for two days, to two; a dosage of two grains per pound was administered in a single dose to two calves, orally to one and intravenously to the other. Within 24 hours decided improvement was noted and temperatures were approaching normal. By the third day, all temperatures were normal, symptoms had abated, and complete recovery followed. Even though the dosage of two grains per pound was twice that recommended, no symptoms of toxicity were observed.

Following these early results, a dosage of one grain per pound of body weight was usually administered. Oral treatment was administered unless severe symptoms were apparent and the condition of the animal indicated the need for immediate effective blood concentrations of the drug. In these cases, the initial dose was given intravenously and this was followed by oral dosing. The drug was administered until temperature and respiration were normal, usually about four days, but with a range of two to six days. Complete recovery was apparent in from two to 10 days after treatment.

In the first outbreaks treated, sick calves were isolated immediately and for at least a

week after symptoms of pneumonia had subsided. However, it was found that, with the large numbers of calves involved, some cases were not noted until there was considerable lung involvement and, consequently, slow response to treatment, or death, followed. In subsequent outbreaks, therefore, those animals with high temperatures and showing symptoms were not isolated but were treated in the herd. The drug was mixed in the grain and fed to all animals in the pen so that those in the early stages of the disease that were not detected, nevertheless received treatment. Of a total of 39 calves treated, only one calf was lost under this system. At necropsy of this animal, there was very extensive lung involvement.

CHART I.—TREATMENT OF PNEUMONIA IN CALVES WITH SULFAMETHAZINE

	No. of animals	Approx. weight	Temperature	Duration of illness. Days	Treatment - Drug adm. once daily: Initial gr/lb	Route	Subsequent gr/lb	Route	No. of days treated	Results
Isolated	2	150	104.3 104.8		1	oral	1	oral	2	Complete recovery. Temperatures 3rd day 102.6 and 102.2
	1	150	106.0		2	oral			1	Complete recovery. Temperature 3rd day 102.9
	1	150	105.0		2	i.v.			1	Complete recovery. Temperature 3rd day 102.2
Not isolated	16	100 - 350	103.4 - 106.0	5-15	½ - 2	oral	½	oral	2-6	15 recovered. In one, disease too far advanced - considerable lung involvement - died.
	8	100 - 175	103.0 - 105.0	2-6	1	oral	1	oral	2-6	8 recovered
	12	100 - 250	103.0 - 106.0	2-6	1	oral	1	oral	2-6	12 recovered. One having severe lung involvement continued to cough and show respiratory embarressment and was destroyed.
	3	250	102.8 - 105.5	3-7	1	i.v.	1	oral	2-7	3 recovered
Totals	43									42 - 97.6% recoveries

Oral administration—sulfamethazine powder in gelatin capsules
Parenteral administration—sterile solution sodium sulfamethazine 25% w/v

Blood Concentration Studies

Sulfamethazine blood concentrations were determined using the LaMotte sulfonamide test kit.

As there is a direct correlation between blood concentrations and therapeutic efficiency in sulfonamide treatment, as a point of interest blood concentrations were determined at intervals throughout treatment. Chart 2 shows blood concentrations obtained.

Frequently, due to the large numbers of animals involved, individual records were not kept. However, it was noted that, when the drug was given orally, an effective concentration of approximately 5mg per 100cc of blood was attained in about six hours after the initial dose. After subsequent doses, the concentration usually rose to as high as 10 or 11mg per 100cc and persisted slightly higher as long as treatment continued. However, blood concentrations above 10mg per 100cc were present in samples drawn one hour after injecting the drug intravenously and were maintained throughout treatment periods by oral doses.

No attempts were made to check blood concentrations for longer than eight hours after the final dose except in four cases, calves No. 8 through 11 of Chart 2. In the two calves that received sulfamethazine orally at a dosage of one grain per pound body weight for two days, concentrations were determined 24 hours after the final dose of the drug. At that time, the blood concentration persisted at approximately the same level as that recorded immediately after the final dose. From the results usually reported on blood concentration studies, it would seem logical to suppose that higher concentrations would have been present had determinations been made in the interval. The fact that similar concentrations were recorded would not indicate the maintenance of a constant threshhold throughout that period. In the two calves, No. 10 and 11, that were treated with a single dose of two grains per pound, one intravenously and one orally, blood concentrations were determined once a day for three days. At eight and 24 hours, similar levels of 10.9mg per 100cc were recorded. At 48 hours the blood concentration of calf No. 10 had decreased to 9.8mg and of calf No. 11, to 8.7mg.

Discussion

In sulfonamide treatment of pneumonia, the condition of the lungs at the start of treatment is very important. If lung involvement is great, the prognosis is poor. When the disease has progressed sufficiently to produce dense tissue barriers and impair circulation to the part, therapeutic blood concentrations

of sulfonamide at the site of infection may be difficult to attain.

I have also used sulfathiazole, sulfapyridine, and sulfamerazine in the treatment of calf pneumonia. Sulfathiazole requires frequent dosing because of its rapid excretion and sulfapyridine must be used with extreme care as toxic reactions are common. Comparable results are obtained with sulfamethazine and sulfamerazine. However, toxic reactions, such as hematuria, have followed the administration of sulfamerazine. Sulfamethazine treatment, in my experience, has resulted in more rapid recovery and, at no time have there been any signs of toxicity regardless of the dosage or the route of administration. A lower dosage than other sulfonamides used has maintained high, effective blood concentrations, and large doses have been injected parenterally without adverse affects, when it seemed necessary to saturate the tissues of an acutely ill animal quickly.

Pneumonia in Adult Cattle

Sulfamethazine has been used in the treatment of eight heifers and cows, as shown in Chart 3. Most cases treated were severe pneumonia of two to seven days' duration. The animals were toxic and weak and exhibited typical symptoms. The majority were treated orally at a dosage of one grain per pound of body weight, once daily, until temperatures and respiration were normal. However, excellent results were obtained when the initial dose was given intravenously.

Supportive treatment was always given in these cases. The affected animals were isolated, and respiratory and rumen stimulants were given. Dextrose was given by intravenous injection when necessary.

Clinical improvement was noted in 24 hours by a drop in temperature. Appetites improved rapidly. Usually, in 10 days, complete recovery had taken place. Of those treated, only one cow died. This animal had injured a teat,

CHART II.—BLOOD CONCENTRATIONS OF SULFAMETHAZINE ON DOSAGE ONCE DAILY

Calf No.	Daily dose gr/lb	No. days treated	Route of administration	Hours after dosing	Blood concentration - mg/100cc. Days 1	2	3	4	5	Temperatures Days 1	2	3	4	5	6
1	1	3	oral	1		9.8				105.0	103.5	102.8			
				8	6.5		13.1								
2	1	3	oral	8	8.7	10.9	13.1			105.8	104.2	103.0	102.4		
3	1	2	oral	8	7.6	12.0				104.4	102.8	102.0			
4	1	4	oral	8	6.5	13.1	15.3	15.3		106.0	104.4	103.8	103.0	102.6	
5	1	3	oral	8	7.6	10.9	13.1			104.2	103.6	103.0			
6	1	2	oral	8	9.8	10.9				103.8	103.0	102.4			
7	1	5	oral	8	7.6	9.8	10.9	13.1	13.1	105.0	104.2	104.0	103.8	103.2	102.8
8	1	2	oral	8	4.4	5.5				104.3	105.0	102.6			
				24			5.5								
9	1	2	oral	8	4.4	5.5				104.8	102.0	102.2			
				24			5.5								
10	2	1	oral	8	10.9					106.0	104.8	102.9			
				24		10.9									
				48			9.8								
11	2	1	intra-venous	8	10.0					105.0	103.4	102.2			
				24		10.9									
				48			8.7								

CHART III.—TREATMENT OF PNEUMONIA IN COWS WITH SULFAMETHAZINE

No. of animals	Approx. weight	Temperature	Duration of illness Days	Treatment - Drug, adm. once daily. Initial gr/lb	Route	Subsequent gr/lb	Route	No. of days treated	Results
2	500 - 800	102.8 - 105.5	3-7	1 - 1½	i.v.	1	oral	2-7	2 recovered
6	varied	102.5 - 105.0	2-4	1	oral	1	oral	2-5	6 recovered
8									8 - 100% recoveries

Oral administration—sulfamethazine powder in gelatin capsules
Parenteral administration—sterile solution sodium sulfamethazine 25% w/v

gangrenous mastitis set in, and death followed. This case has not been included in the chart.

Before sulfamethazine treatment, the mortality from this type of pneumonia in this herd was high. The prognosis was always

Sulfamethazine treatment has resulted in rapid recovery without any signs of toxicity

poor. Since the institution of this treatment, however, recovery is regularly expected.

Summary

1. The treatment of pneumonia in cattle with sulfamethazine is described.

2. A dosage of one grain per pound of body weight in both calves and cows, given orally once daily until temperature and respiration were normal, was found effective.

3. In acute conditions, intravenous administration of the initial dose resulted in rapid reduction of temperature. Subsequent doses were always given orally.

4. Of 43 calves treated, 42, or 97.6%, recovered; all of the eight cows treated recovered.

5. Sulfonamide blood concentrations were determined at intervals during treatment.

6. Effective blood concentrations were present one hour after parenteral and six hours after oral administration of the drug.

7. No systemic toxic reactions were noted, even when the dosage was double that recommended.

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Control of Anthrax in Persia

Anthrax is the principal cause of loss of sheep in Persia. The animals number 15 million and of recent years the annual loss is estimated to have been one million. Because the herds are nomadic, and because of the large numbers it is not possible for the shepherds to dispose of the carcasses, hence vaccination must be relied upon to keep losses within bearable proportions. The number of sheep vaccinated annually is about 1½ million and epizootics of anthrax are frequent. Before the war up to six million animals were vaccinated yearly and the losses were minimal. Human cases of anthrax in Persia vary with the rise and fall of the prevalence of the disease in sheep.

The treatment of bovine leptospirosis is that of desperation — no specific treatment known. The mortality is 10%. The disease was first reported in cattle in Russia in 1935. In studies which have been made, there is evidence to suggest that there is more than one type of bovine leptospirosis. Foci of the disease in Texas, Illinois and on Eastern seacoast should place us on our guard against the disease. Every veterinarian should cooperate with a laboratory in suspected cases. Symptoms: Temperature 104-107° F., rapid respiration, anorexia, profuse nasal discharge, anemia, jaundice. Chronic cases often have persistent diarrhea. A factor of importance is, infected animals should be isolated, a sanitary water supply should be provided. There is no known treatment. The disease is a public health problem as it may be transmitted to man.—*Robert Graham.*

Livestock Disease Control

It is our opinion that the livestock industry of the United States is now at the crossroads in its disease control effort. If we are able to meet and conquer our more important livestock diseases, we will pass on a much more economical, profitable, and healthier livestock industry to the next generation.

The makeup and content of the human diet will be improved and thereby the health of the entire nation.

A profitable, economical livestock industry insures an ever-growing trend toward a permanent, soil-conserving agriculture that follows ruminants wherever they may go.

If we admit defeat on brucellosis and other equally insidious diseases that are appearing on the American scene, we must recognize that future generations will work under tremendous handicaps unknown to livestock farmers of our time.—*Hoard's Dairyman.*

Sulfonamide Blood Concentrations In Foxes

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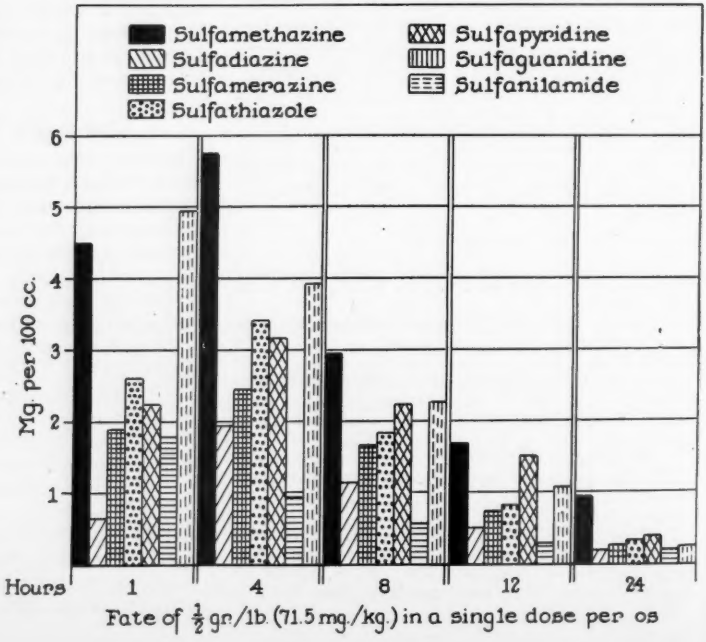
THE successful treatment of acute bacterial diseases in domestic animals with sulfonamides stimulated absorption and excretion studies of these drugs in fur bearers. Little has been reported on the use of sulfonamides in these species, but they have been recommended in the treatment of mink diseases. However, since the fox is subject to infections of bacterial origin, such as pneumonia, septicemia, and infectious bacillary enteritis, including paratyphoid, usually caused by organisms reported to be susceptible to sulfonamides, it was considered important to initiate studies which would suggest optimum dosage of the various sulfonamides in this species.

Since the maintenance of adequate sulfonamide concentrations in the blood is essential for successful therapy, a knowledge of blood concentrations obtained at various dosages and by different routes of administration, and their excretion rates, will act as a basis for dosage schedules for the treatment of the sick animal. Generally speaking, sulfonamides have the same bacteriostatic activity at the same concentrations. There is considerable variation, however, against different species of organisms. For all practical purposes, it is important that we attempt to maintain concentrations above 5mg per 100cc of blood during the treatment period.

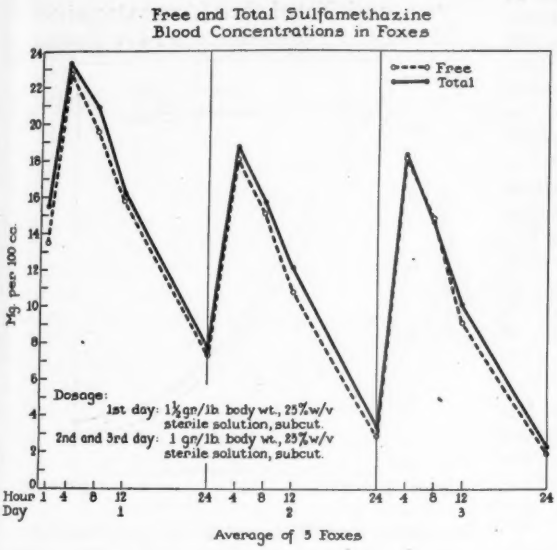
An original study[1] in seven species of domestic animals showed variations in excretion rates, as indicated by persistence of blood concentrations, of seven sulfonamides administered orally at a fixed low dosage. In these experiments, sulfamethazine generally produced the highest and most persistent blood concentrations. As sulfamethazine has been found to be one of the least toxic of the sulfonamides in animals and is active against a wide variety of both gram-negative and gram-positive organisms, a thorough investigation[2,8] of blood concentrations of this drug in various domestic animals was conducted. In normal cattle, swine, horses, dogs, cats, calves, and sheep, a single, non-toxic dose of sulfamethazine maintains therapeutic blood concentrations for 24 hours. In mink[5] high concentrations were obtained promptly by parenteral administration of subtoxic doses of the drug, and optimum bacteriostatically effective concentrations were maintained through the 12th hour. Effective levels persisted for 24 hours. Effective levels also were maintained with a 1:500 solution of the sodium salt *ad lib* in the

Figure 1.
Sulfonamide Blood Concentrations in Foxes



*The authors are indebted to Mr. Francis Pfohl of the Animal Industry Section, and Mr. S. Senn of the Analytical Section, Lederle Laboratories Division, American Cyanamid Company, for aid in the program.

Figure 2.


Free and Total Sulfamethazine
Blood Concentrations in Foxes
Free
Total
Mg. per 100 cc.
Dosage:
1st day: 1½ gr/lb body wt., 25% w/v sterile solution, subcut.
2nd and 3rd day: 1 gr/lb body wt., 25% w/v sterile solution, subcut.
Hour 1 4 8 12 24 4 8 12 24 4 8 12 24
Day 1 2 3
Average of 5 Foxes

drinking water. The present study shows blood concentrations of seven sulfonamides in foxes and of sulfamethazine given by various routes.

Procedure

Normal foxes, approximately two months of age, were used in four experiments. The same animals were used throughout, with rest periods of at least one week between each trial. Blood samples were drawn from the radial or saphenous veins one hour after the drug was given, and at 4, 8, 12, and 24 hours of each day of the tests. Sulfonamide determinations were made according to a modification[1] of the Bratton-Marshall method[9].

Experiment 1.—This experiment was a comparison of blood concentrations of sulfamethazine, sulfadiazine, sulfamerazine, sulfathiazole, sulfapyridine, sulfaguanidine, and sulfanilamide in five foxes. A single dose of 0.5 grain per pound of body weight was given orally in gelatin capsules. This test gives a comparison of the seven sulfonamides at low dosage.

Experiment 2.—A therapeutic dosage of 1.5 grains per pound of body weight on the first day, and one grain per pound on the second and third days, was injected subcutaneously into five foxes. Sterile solution of sodium sulfamethazine 25% weight/volume was used. The drug was given once daily.

Experiment 3.—A solution of sodium sulfamethazine in drinking water was prepared, at a concentration of 1:500, and was made available to the animals for two days. Non-medicated water was removed from the pens.

Experiment 4.—Following a report[10] by the veterinarian in charge of fur animal disease control work in Finland, that absorption of sulfonamides adequate for therapeutic effectiveness can be obtained by rectal administration of the drug, this method was tried in four foxes. A dosage of one grain per pound was administered in a single dose. The foxes were restrained, head down, and the material was injected with a syringe with a glass tip. Because the dose volume of a 10% solution is small and the preparation not irritating, none of the solution injected was expelled.

Discussion

Figure 1 is a summary of average blood concentrations of free drug. Although the concentration of sulfanilamide was higher than the other drugs tested at one hour, and significant levels were present throughout the test, its clinical use has been shown to be limited by its narrow range of activity against organisms other than streptococci. The sulfamethazine blood concentration at this time was only slightly lower, and persisted considerably higher than the others throughout 24 hours. Sulfadiazine concentrations were lower than all others with the exception of sulfaguanidine which is poorly absorbed, and ordinarily is active only in the lumen of the gastrointestinal tract. Sulfamerazine concentrations were slightly higher than sulfadiazine, but were lower than sulfathiazole and sulfapyridine.

Figure 2 summarizes blood concentrations attained following subcutaneous drug administration of 1.5 grains per pound of body weight. Prompt high blood concentrations were present at one hour which continued to rise to a peak at four hours, followed by a gradual decrease. At 12 hours, the average blood concentration was still higher than the one-hour reading, and, at 24 hours, therapeutically effective concentrations persisted. On subsequent days, there was a rise in blood concentrations following administration of one grain per pound of the drug, followed by the characteristic decrease, illustrating that, at the dose given, there was no drug accumulation and the maintenance dose of two-thirds the initial dose was adequate.

Figure 3 summarizes blood concentrations attained by a 1:500 dilution in the drinking water. Low and irregular concentrations were

attained. Unlike the mink which readily consumed the medicated water, the foxes did so only when forced to drink it by extreme thirst. The sudden rise in concentration on the second day bears out this observation. A 1:1000 dilution may possibly have been more palatable, but it is questionable whether enough of the weaker solution would have been consumed to achieve adequate blood concentrations.

Figure 4 shows average blood concentrations following rectal injection of sodium sulfamethazine. Rapid absorption of the drug was evident at one hour. The blood concentration decreased, thereafter, and at 12 hours, an adequate concentration was still present. A low concentration was recorded, however, at 24 hours.

Summary

1. Blood concentrations were determined following oral administration of 0.5 grain per pound of body weight in a single dose of sulfamethazine, sulfadiazine, sulfamerazine, sulfathiazole, sulfapyridine, sulfaguanidine, and sulfanilamide.

2. Sulfamethazine maintained the highest concentrations throughout the period of the test.

3. Sulfamethazine was administered subcutaneously, orally in the drinking water, and rectally.

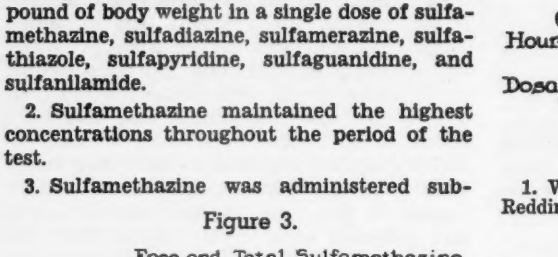
4. A single daily dose of sulfamethazine, injected subcutaneously at a dosage of 1.5 grains per pound on the first day, and one grain per pound on subsequent days, maintained effective blood concentrations throughout the test.

5. At a 1:500 dilution in the drinking water, low and irregular concentrations were obtained, due to the unpalatability of the solution.

6. Following rectal injection significant concentrations were maintained for 12 hours.

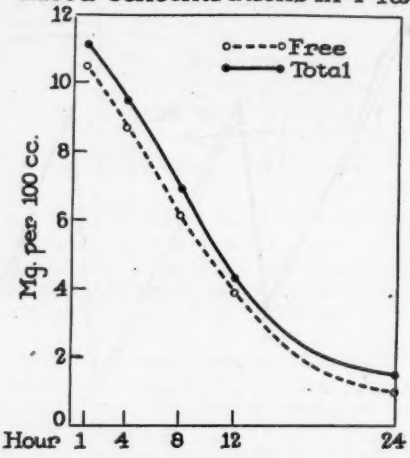
7. There were no signs of systemic toxicity at any of the dosages used.

Figure 3.



Dosage:
1:500 dilution in drinking water ad lib for two days.

Figure 4.



Dosage: 1 gr/lb body wt. single rectal injection of sodium sulfamethazine 10% sterile solution.

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A Virus of Low Virulence for Immunizing Fowls against Newcastle Disease (Avian Pneumoencephalitis)*

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Introduction

Immunization studies with Newcastle disease by many previous investigators have demonstrated the limitations of killed virus vaccines for durable immunity.[1, 4] This has resulted in the recent development of several live-virus vaccines for this purpose.[2, 5, 6, 7, 8] The following is a report on a strain of virus of low virulence which, in a limited number of tests, has shown good possibilities for use as a vaccine. The strain of virus, designated herein as Bl, was received along with a shipment of eight strains of Newcastle virus from Dr. F. R. Beaudette of the New Jersey Agricultural Experiment Station. It was sent in response to a request for a strain of infectious bronchitis virus and was labeled "B-1073, the 71st egg-passage of an embryo-killing strain of infectious bronchitis virus." The eight Newcastle strains were requested for the purpose of studying strain variation on erythrocyte hemagglutination and in the course of this work the Bl strain of virus was also subjected to the same tests. It was observed that hemagglutination, not unlike that exhibited by the strains of Newcastle virus, took place, and further that hemagglutination-inhibition occurred when it was tested with Newcastle antisera. In addition, serumneutralization tests in embryonated eggs with Newcastle antisera from this laboratory and from the laboratories of the U. S. Bureau of Animal Industry, gave significant neutralization with the Bl virus. Just how this virus lost its identity as infectious bronchitis is unknown to Doctor Beaudette[3] and to the authors.

Since the Bl strain behaved in every respect as a Newcastle strain of virus, a group of baby chicks susceptible to the disease was inoculated intranasally to determine its virulence. The chicks showed very little reaction and when challenged 19 days later, with a known virulent strain of the virus, proved to be immune. Other preliminary immunization trials gave similar results which prompted further experimentation with this strain using birds confined under controlled, isolated conditions.

The advantages of a non-virulent strain that, when used as a vaccine, would produce the enduring immunity of a live virus and possess the safety of a killed virus, are obvious.

Experimental Procedure

The chickens used in these tests were obtained from the Experiment Station breeding flock which is known to be free of Newcastle disease. The birds were maintained in an isolation building, which provided four separate rooms for adequate segregation of each lot. Immunization was determined by the appearance of a significant HI titer in a pooled serum sample from a few birds in each lot, and proof of protection against the disease was ascertained by challenging the vaccinated birds, along with some non-vaccinated controls, by intranasal instillation with a virulent strain of the virus. The virulent strain of virus used, was the California strain No. 11914, herein designated as N2. It was selected for challenging because of its virulence and its highly neurotropic characteristic which provided visual evidence when a bird was affected.

The vaccine used for immunization was composed of a 20% broth suspension of entire embryos previously inoculated with the Bl virus. Embryonated eggs were inoculated with this virus on the 11th day of incubation. The harvested virus included all killed embryos till 50% mortality occurred, as well as those that remained alive at this stage, which was usually from 48 to 72 hours after inoculation. The suspensions were made by use of a Waring blendor, followed by filtration through sterile cotton. The vaccine was held in a frozen condition. Titration of the first two lots of vaccine in 11-day-old embryonated eggs with 0.1 ml inoculum gave LD_{50} titers of 10^{-6} and 10^{-5}, respectively.

Vaccination, except where otherwise indicated, was performed by intranasal instillation of the vaccine into one nostril by means of a syringe with a blunt 21-gauge needle; using approximately 0.05 ml for all ages of birds. The nostril was selected as the site of inoculation because of the ease of administration by this route.

* This work is a cooperative project with the U. S. Bureau of Animal Industry.
† Section of Animal Pathology, Virginia Agricultural Experiment Station.

Results of Controlled Experiments

Although comparatively small numbers of birds have been used in the experiments to date, the results have been so striking and conclusive, that it is believed the data presented are highly significant.

Table I summarizes the immunization trials conducted under controlled isolation of the birds, in which there was approximately an equal number of controls for each lot tested. No evidence of infection or systemic reaction was observed in the older birds as a result of vaccination and only in occasional chicks were any respiratory symptoms noted. These were manifested as a hoarse chirp or nasal discharge but in no instance was paralytic or nervous symptoms observed in the vaccinated birds. In Lot 1, one bird of the vaccinated group showed paralysis eight days after the challenging dose. It was the only one of the group to show any paralytic symptoms. These chicks were held under observation for 14 days after being challenged, at which time they were killed and examined. On post-mortem examination four chicks showed slight evidence of caseous deposits on the air sacs. In Lot 2, one of the vaccinated birds developed a slight nasal discharge, following the challenging dose, but none developed paralysis. When killed and examined three weeks later all but three of the chicks revealed congested lymphoid patches in the intestinal tract, but no other gross lesions.

Lot 3 was vaccinated in the web of the wing by the "stick" method using only one needle. These chicks developed no HI titer as a result of vaccination by this method and when challenged with the N2 virus all but one succumbed to the infection. (One chick was sacrificed 10 days after vaccination to check its HI titer.) Because the intranasal method of inoculation had given such good results the "stick" method was not tested further.

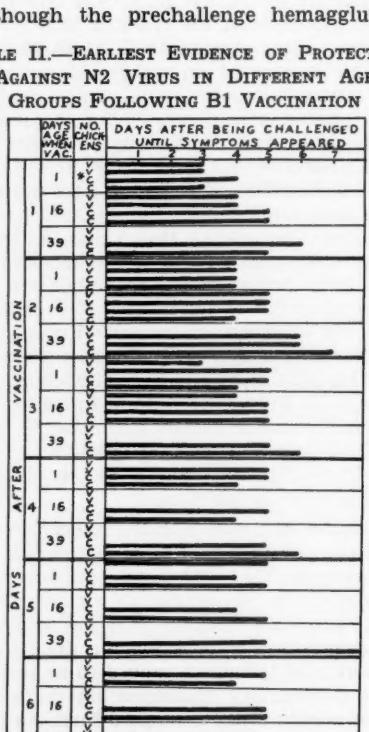
Although the prechallenge hemagglutination-inhibition (HI) titer of pooled serum from two birds of Lot 4 was not significant according to accepted standards for the HI

TABLE I.—RESULTS OF CHALLENGING VACCINATED AND CONTROL BIRDS WITH N2 VIRUS

	VACCINATED							CONTROLS		
Lot No.	No. birds	Days Age	Pre-Vac. HI titer	Route	Days Chall. after Inoc.	Pre-Chall. HI titer	No. visibly paralyzed	No. birds	Pre-Chall. HI titer	No. visibly paralyzed
1	12	15	* 2/0	IN	10	* 2/80	1	13	* 2/0	12
2	13	7	1/0	IN	11	1/160 ≠	0	12	1/0	12
3	13	8	1/0	stick: wing web	19	2/0	11	12	2/0	11
4	12	94	2/0	IN	34	2/20	0	10	2/0	7
5	15	1	1/0	IN						
	4	56			56	2/160 ≠	0	4	2/0	4
	4	115			115	4/40	0	4	4/0	4
6	5 poults	54	2/0	IN 0.1cc	12	3/160	0	3	2/0	1

* No. pooled serum samples /HI titer IN = intranasal

TABLE II.—EARLIEST EVIDENCE OF PROTECTION AGAINST N2 VIRUS IN DIFFERENT AGE GROUPS FOLLOWING B1 VACCINATION



test, pooled serum samples from two birds each, 15 and 25 days previously, gave HI titers of 320.

The chickens in Lot 5 were vaccinated at one day of age to be retained for determining the duration of immunity. Four were challenged with the N2 virus at 56 days and four more at 115 days of age, the longest period tested to date. As seen in Table I both groups of vaccinated birds were protected whereas all controls developed marked paralytic symptoms.

Table II summarizes the data obtained from an experiment designed to determine how soon after vaccination the birds were protected against a virulent strain of Newcastle virus. In each age group one lot of chicks was vaccinated and another lot was held as controls. On successive days following vaccination two chickens from the vaccinated lot and two from the control lot were challenged by intranasal inoculation with 0.05 ml of a.a. fluid containing the N2 virus. The appearance of paralytic symptoms was used as a criterion of non-protection. The birds were held under observation for a minimum period of two weeks after the last vaccinated birds were challenged.

Observation of the results in Table II reveals that in the 39-day-old group, the two vaccinated birds challenged one day after vaccination were protected, whereas one of the two vaccinated birds did succumb to paralysis when challenged two days after vaccination. All vaccinated birds challenged three days after inoculation or later were fully protected. Even though the birds were protected shortly after vaccination, a significant HI titer did not appear in the blood serum until approximately the 8th day.

From the data on the other two groups it is apparent that protection was delayed with the decreasing age of the chick. In the 16-day-old group protection was not afforded the chicks until four days following vaccination. In the day-old group partial protection was evident on the 4th and 5th days, but was not complete until the 6th day following vaccination. Although it is not shown in the table, the experiment was carried on for eight days after vaccination in each group of birds. Results on the 7th and 8th days were identical to those of the 6th day, with the exception of the one-day-old group on the 7th day after vaccination. One of these vaccinated chicks developed a slight limp 14 days after the challenge exposure, but had apparently recovered when killed one week later.

TABLE III.—OCCURRENCE OF CONTACT INFECTION FROM B1 VACCINATED BIRDS

AGE DAYS	CAGE	No. birds	HI TITER OF POOLED SERUM SAMPLES: 7/17	7/23	7/27	7/30	8/3	8/7	8/11
60	C								
	A	2 V	0	20		>80			
	G								
	E								
	1	2 C	0	0		>80			
	C								
	A	2 V	0		>160				
	G								
	E								
	2	2 C	0		>160				
40	C								
	A	2 V	0	0		>80	>80	20	>160
	G								
	E								
	3	2 C	0	0		0	10	0	0
	C								
	A	2 V	0		>160				
	G								
	E								
	4	2 C	0		10	10	>80		

V = Vaccinated C = Control

In order to learn whether or not vaccinated birds could infect others by contact, four cages were set up containing two vaccinated and two control birds in each. Eight of the birds were 60 days old and eight were 40 days old, at the beginning of the experiment. It was planned to bleed the birds in one cage from each group at alternate intervals until a significant HI titer appeared. The serum samples from the two vaccinated and two control birds from each cage were pooled. In Table III it is apparent that contact infection took place in cages 1, 2, and 4 evidenced by a significant HI titer in 13, 10, and 17 days, respectively. Unfortunately, individual tests were not made on each control bird and therefore only one infected bird may have been responsible for a positive test. The controls in cage 3, on the other hand, did not show a positive HI test for 25 days indicating that contact infection should not be relied upon as a means of immunizing flocks. The four birds in cage 3 were challenged with N2 virus on the 26th day after initiation of the experiment. A pooled serum sample from the two controls 11 days after the challenge exposure gave an HI titer of 1280. No nervous symptoms developed in any of the chicks during a 14-day observation period. The negative HI titer of the controls at 25 days and their failure to develop symptoms after being challenged may be explained by the fact that protection is afforded the birds several days before a detectable HI titer appears in the serum.

In an attempt to determine the effect of this strain of virus on egg production, 13 New Hampshire Red pullets were placed in one

room of the isolation building and vaccinated with 0.1ml of the B1 vaccine. A pooled serum sample from three of the birds prior to vaccination gave a negative HI titer. Egg production records were kept 10 days prior to vaccination and continued for several weeks following. One bird became sick on the 9th day following vaccination. This bird was killed and upon autopsy was found to have gross lesions of visceral lymphomatosis but

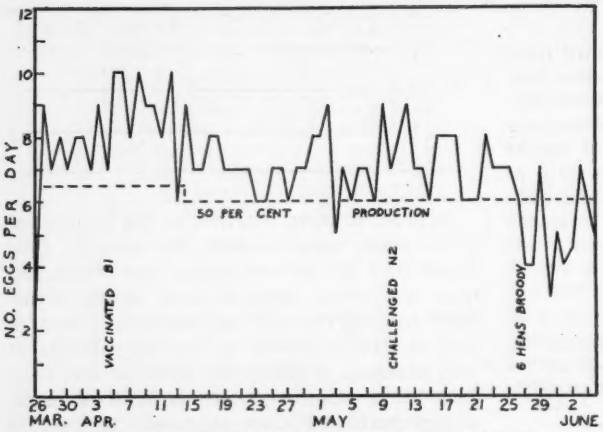


FIG. 1-EFFECT OF B1 VACCINATION ON EGG PRODUCTION UNDER CONTROLLED CONDITIONS

no evidence of Newcastle disease. A pooled serum sample of two pullets taken on the 10th day following vaccination revealed an HI titer of 320. Figure 1 shows the daily production record of this pen of hens prior to and after vaccination, including a period following a challenge exposure with the N2 virus, 36 days after vaccination. There was no appreciable drop below 50% production at any time, until a number of the hens became broody, at which time the experiment was terminated.

Before the foregoing experiment was terminated, 53 chicks were hatched from eggs laid by this pen of B1 vaccinated birds. Pooled serum samples from two one-day-old chicks from two different hatches revealed an HI titer of only 40. Four small groups of these chicks, numbering 10, 8, 11, and 7, were challenged with the N2 virus at 1, 7, 16 and 48 days of age, resulting in visible paralysis in 60, 50, 27, and 71% of the chicks, respectively. Only one group of eight chicks was vaccinated with the B1 vaccine at one day of age. One weakling was removed from the group three days after vaccination. The seven remaining chicks were challenged with the N2 virus at 40 days of age. None exhibited any reaction or paralysis as a result of the challenge exposure during a 30-day observation period.

Results of Field Tests

Shortly after it was learned that this strain of virus had little effect on egg production an opportunity was afforded to make a field test on a laying flock. A poultryman submitted some baby chicks to the laboratory for examination upon which a clinical diagnosis of Newcastle disease was made. This diagnosis was later confirmed by the HI test. The laying flock on this farm, comprising around 1,500 White Leghorn hens, was located approximately 50 yards from the brooder which housed the infected chicks. The laying house was divided in the center by a feed room and the owner consented to the vaccination of one-half of the flock, leaving the other half as controls. An actual count of the birds in each pen was not made and previous production records for each half of the house had not been maintained. It was estimated that there were 750 birds in each pen but from the production records the first few days following vaccination (figure 2) it appeared that there may have been a considerable difference in the number of birds in the two pens. Therefore the effect of the vaccination may not be accurately, but only approximately, reflected in figure 2.

These hens were vaccinated with approximately 0.05 ml of the same lot of vaccine which had been used in the laboratory tests. Daily production records were kept on the vaccinated and non-vaccinated pens from the date of vaccination. From the production records (figure 2) it may be seen that Newcastle disease spread through the flock shortly after the time of vaccination, reducing egg production to zero in the non-vaccinated pen. Although the vaccinated pen dropped considerably in production the decrease was not nearly so abrupt and a comparatively high production level was maintained. It is reasonable to assume that the procedure of catching the birds would disturb production slightly. However, it is interesting to note that the pattern of the two curves is very similar and the greater portion of the drop in the vaccinated pen might be attributed to the presence of a virulent virus prior to the establishment of solid immunity.

Approximately two weeks later this same owner requested vaccination of another flock of approximately 200 White Leghorn layers,

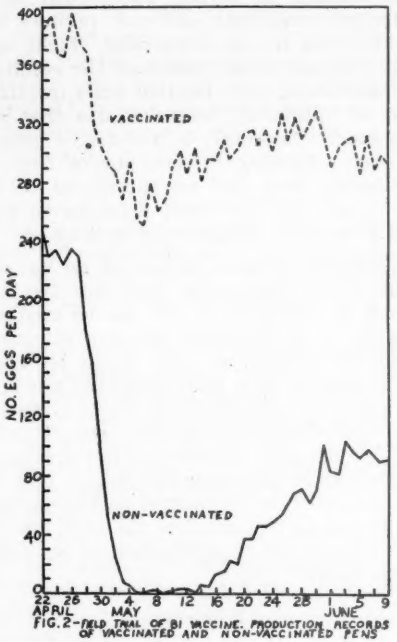


FIG. 2-FIELD TRIAL OF BI VACCINE. PRODUCTION RECORDS OF VACCINATED AND NON-VACCINATED PENS

which were located a considerable distance from the flocks previously mentioned. These were attended by a separate caretaker and it is doubtful if they were exposed to the virulent strain of virus after vaccination. Figure 3 shows the production record of this flock for four weeks following vaccination. Although there was a gradual decrease in production it should be mentioned that 28 birds were culled from the flock during that period. This farm had a retail trade and made it a practice to cull the flocks closely as the birds went out of production. Whether vaccination played any part in increasing the number of culls is not known.

A limited number of field trials have been conducted on chickens of various ages, including some one day of age. To date the owners have not reported any unfavorable reaction in the flocks as a result of vaccination, with the exception of one flock of baby chicks. This group of 400 White Leghorns was shipped from an out-of-state hatchery and was delayed in transit two days. The chicks were in a weakened condition upon arrival, but were vaccinated immediately because of the presence of Newcastle disease on the premises. Two chicks were sacrificed for serum samples for the HI test which was found to be negative. This flock was visited one month later at which time the owner reported approximately 12 chickens had developed twisting of the head and neck. Since this strain of virus had never exhibited nervous symptoms in the laboratory tests, it is believed that the chicks may have been exposed to a more virulent strain prior to vaccination. Additional field trials with this strain of virus are now being conducted. The results will be reported later.

Discussion

Whether this strain of Newcastle virus of low virulence will produce a durable immunity

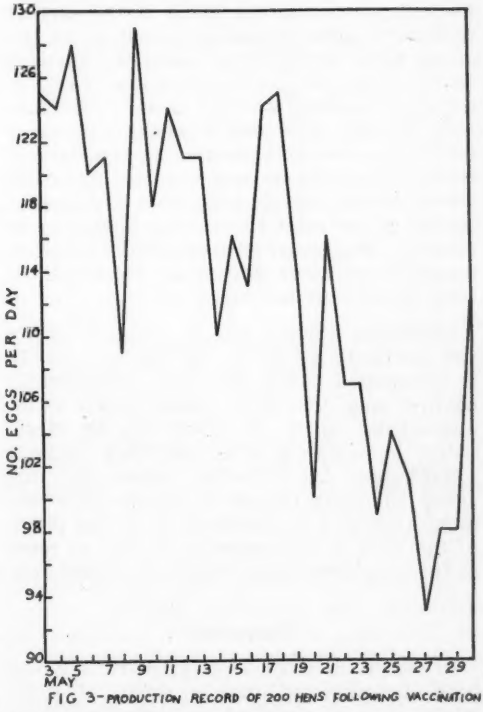


FIG 3-PRODUCTION RECORD OF 200 HENS FOLLOWING VACCINATION

remains to be determined by prolonged observation of vaccinated birds. The fact that this strain of virus can be used on day-old baby chicks and laying flocks offers certain advantages in vaccination against Newcastle disease which are not possessed by some of the other vaccine strains. Although it is assumed by some authorities that the disease can be controlled by mass vaccination of all birds between four weeks of age and maturity it is doubtful that poultrymen, with the possible exception of the heavily populated poultry areas, will carry on such a rigid pro-

gram universally. This has been borne out in past experience with the use of fowl-pox and laryngotracheitis vaccines. In such instances where poultrymen may fail to vaccinate and outbreaks do occur it would be highly advantageous to have a vaccine strain which could be used on birds of all ages.

The intranasal route of vaccination was chosen for the reason that it is not only convenient and rapid, but it may give earlier protection to the birds by establishing refractivity of the respiratory epithelium to virulent strains of virus. The respiratory epithelium is, undoubtedly, the most common portal to natural infection. This would, therefore, have practical application in helping to check the spread of infection in closely confined pens. As was pointed out in Table II the earliest protection from vaccination occurred in the oldest birds, immediately raising the question as to whether or not this was due purely to the "interference" or "cell block" phenomenon. If this were true it seems reasonable to assume that cell blocking in the day-old chicks would be as rapid as in the older chicks. Since this did not occur, earlier protection in the older birds would appear to be related to the earlier antibody response which, according to Wolfe and Dilks,[9] is correlated with the age of the chicks.

Additional studies will be required before the immunity status of the hatched chicks is established. This may have considerable bearing upon the value of this strain as an immunizing agent. If chicks can be vaccinated immediately after hatching without interference from passive immunity, this would eliminate periods of questionable immune status. A complete study of this phase of the work is contemplated as soon as some of the vaccinated birds come into production.

Summary

In controlled laboratory experiments it has been demonstrated that a strain of Newcastle disease virus of low virulence can be used to vaccinate chickens of all ages, including day-old chicks and birds in full production, without producing any marked reaction in the birds. Vaccination was accomplished by intranasal instillation of 0.05 ml of the vaccine into one nostril. Duration of immunity has not been established. Vaccinated day-old chicks were still solidly immune at four months of age, the longest period tested to date. Vaccination with this strain of virus of 39, day-old chicks revealed protection against a virulent strain of virus as early as 24 hours after vaccination. Protection in younger chicks 16 days and one day of age was delayed until approximately four and six days, respectively.

Vaccination of laying birds, held under controlled conditions, did not produce any marked drop in egg production. Field trials on two laying flocks confirmed the results of the laboratory test. Limited tests on chicks from B1 vaccinated hens indicate that very little passive immunity is transferred through the egg. Whether or not chicks from B1 vaccinated hens can be vaccinated at one day of age has not been investigated sufficiently to reach definite conclusions.

Regardless of these results we do not wish to leave the impression that this strain of virus is so avirulent that it can be used with impunity in baby chicks. A recent attempt to immunize a group of baby chicks by atomization resulted in a high morbidity and mortality, but no evidence of paralytic symptoms. Although occasional chicks have developed mild respiratory symptoms after intranasal instillation in the amounts stated, this was the first evidence of marked pathogenicity in this strain and emphasizes the need for further research in its application as an immunizing agent.

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Results of Surveys to Determine the Incidence of Newcastle Disease

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THE virus of Newcastle disease was first isolated and positively identified in the United States by Brandly and associates[1] early in 1945. The isolation was made from lung tissue of a chicken forwarded to them by Beach, of the University of California. As early as 1940, Stover[2] recognized a disease of poultry in California which had some of the characteristics of Newcastle disease and described it as a respiratory-nervous disorder. It was later given the name "pneumoencephalitis" by Beach[3] who, in 1943, showed that it was immunologically identical to Newcastle disease.

By May of 1946 the disease had been identified in a number of other states. Accordingly, to consider ways and means of coping with this new threat to poultry production, the Chief of the Bureau of Animal Industry called a meeting of members of the poultry industry, state livestock sanitary officials, poultry pathologists, and representatives of the Bureau of Animal Industry. A national committee on Newcastle disease was formed, which shortly thereafter made such recommendations as seemed feasible and in line with the knowledge at hand.

In November of the same year, 1946, the Chief of the Bureau called a meeting of this committee to consider a broad and coordinated research program on the disease. A general outline of the program adopted was as follows:

1. Losses caused by the disease
2. Diagnosis of the disease
3. The virus and its properties
4. Modes of spread
5. Vaccination
6. The development of an immediate and possibly a long-time program.

Subcommittees were appointed to develop programs for each of the above subdivisions.

At this meeting it was decided that an immediate appraisement of incidence and losses caused by the disease should be made in order to determine what further investigations and what control measures should be carried on. The subcommittee on Losses Caused by the Disease, under the direction of Dr. T. C. Byerly, chairman, therefore recommended that the Bureau of Animal Industry collect pertinent data through the state livestock sanitary authorities and other agencies. The Pathological Division of the Bureau requested state livestock sanitary officials and poultry pathologists to report, on prepared forms, cases of Newcastle disease, number and kinds of poultry affected, typical case histories, and related information. The committee also requested the Bureau to conduct a veterinary survey in at least one intensive poultry-raising section to supplement the voluntary reports with more complete data.

This paper is a report of the survey methods used, the results obtained from the voluntary reports, and the results of the survey in the poultry-raising section selected.

Plan of the Nation-Wide Survey

The survey consisted of two major parts. The first involved the cooperation of state veterinarians, all of whom were asked to submit monthly reports to the Bureau of Animal Industry during 1947 on cases of Newcastle disease brought to their attention. Reports from state veterinarians were of two types. The first form requested a list of counties in which affected flocks were found, the number of affected flocks, the number and kind of birds, the number of diagnosis, and the method of diagnosis. The second form called for case histories on individual flocks, including detailed information about the method of diagnosis, origin of stock, prevailing symptoms, presumptive source of infection, duration of outbreak, percentage of flock affected, percentage of mortality, recovery, estimated monetary loss, and other diseases or immunization practices associated with Newcastle disease.

Statistically such data are of limited value insofar as quantitative estimates of numbers of affected flocks and related information are concerned. About all that may be deduced from such reports is that if a state veterinarian encounters a large number of affected flocks, there must be a large number of affected flocks in the state, and *vice versa*. Furthermore, it is quite likely that in general only the more severe cases will be brought to the attention of the veterinarian, thereby giving an exaggerated picture of the percentage of losses sustained by all owners of affected flocks.

In spite of these objections, such a survey can provide useful qualitative information.

*Bureau of Animal Industry, USDA.
†Bureau of Agricultural Economics, USDA.

If the disease constitutes a serious economic problem in any state, the number of outbreaks and the losses reported by the owners will soon make that fact evident; if the disease does not constitute a serious problem, that fact should be similarly reflected by a lack of reported cases. The reports received from the state veterinarians during the year represent the only attempt at a nation-wide survey that was feasible at the time.

Plan of Delmarva Peninsula Survey

The second part of the survey consisted in obtaining information about the disease from a representative cross section of producers in the intensive broiler growing area of Delaware and those portions of Maryland and Virginia that are separated from the mainland by the Chesapeake Bay. This area is commonly referred to as the Delmarva peninsula. This survey was made during May and June 1947 by the Pathological Division of the Bureau of Animal Industry. The survey was designed by statisticians in the Bureau of Agricultural Economics of the Department of Agriculture. The method consisted essentially of a questionnaire-interview of a representative sample of producers in the area.

To obtain a random sample of individual farms from a selected geographic area, several devices may be used. The interviewer may travel along a specified route, keep a count of the number of farms along that route, and stop at every tenth farm or at some other convenient interval that will give him a sample of farms fairly well distributed over the area. Such a procedure can be set up with a minimum of preliminary planning, but it is objectionable on several counts. The farms readily indentifiable as such to the interviewer driving along the road may very likely not be representative of all farms in the area. Furthermore, such a scheme allows considerable freedom of choice in the selection of sample farms. Experience in conducting sample surveys of various kinds has demonstrated that biases will generally creep into the results whenever the interviewer is permitted to select the sampling units in the field. The only way to avoid the possibility of biases is to specify the farms to be visited in advance of the survey and to give the interviewer no freedom of choice based on his inspection of the farms in the field. If a complete list of names and addresses of all farm operators in the area were available, a random sample of those names could be selected without difficulty. Such a list is hardly ever available.

A satisfactory alternative is to divide the area to be surveyed into parts known as strata on county highway maps that show the location of farmsteads and subdivide each stratum into small segments having natural boundaries that can be easily identified in the field. The division of the area into strata should be made in such a way that the farms in any one stratum tend to be more nearly alike with respect to the characteristics we wish to study than farms taken at random from the area as a whole. The size of each segment should be controlled so that every segment contains about the same number of farms.

The segments are then numbered in some convenient order, one is selected for inclusion in the sample, and the others to be included are selected systematically with the interval between them so spaced as to insure the widest geographic distribution of the sample segments over the survey area. The interviewer is then instructed to visit every farm of the kind under study that he finds in the sample segments. This process provides an unbiased selection of a sample of farms without the need of starting with a complete list. This was the sampling method used for the study of Newcastle disease in the Delmarva area.

The first step in designing the survey, therefore, was to delineate the area to be surveyed on county highway maps. The delineated area, embracing approximately 3200 square miles, included all of Sussex County and the lower third of Kent County in Delaware; all of Somerset County and Worcester County, and the eastern halves of Caroline, Dorchester, and Wicomico Counties in Maryland; Chincoteague Island and nearby parts of the mainland of Accomac County in Virginia.

This area, exclusive of Chincoteague Island, was divided into strata according to the recommendations made above and subdivided into 1,629 small segments, each containing about 10 farm dwelling units. Following the procedure described in the preceding paragraph county by county, 40 of those segments were selected for inclusion in the sample. Figure 1 shows the segments selected in Sussex County, Delaware.

The survey included all broiler farms with a capacity of 500 or more birds within the boundaries of the area originally delineated. The 40-segment sample should contain 40/1629, or about 2.5%, of all such farms. Chincoteague Island was not divided into segments because of the lack of a suitable map of the island. At the time the field work was conducted, there were about 200 farms with a capacity of 500 or more birds on the island. Consequently, 2.5%, or five of those farms,

Map Showing Distribution of Farms Selected for Investigation

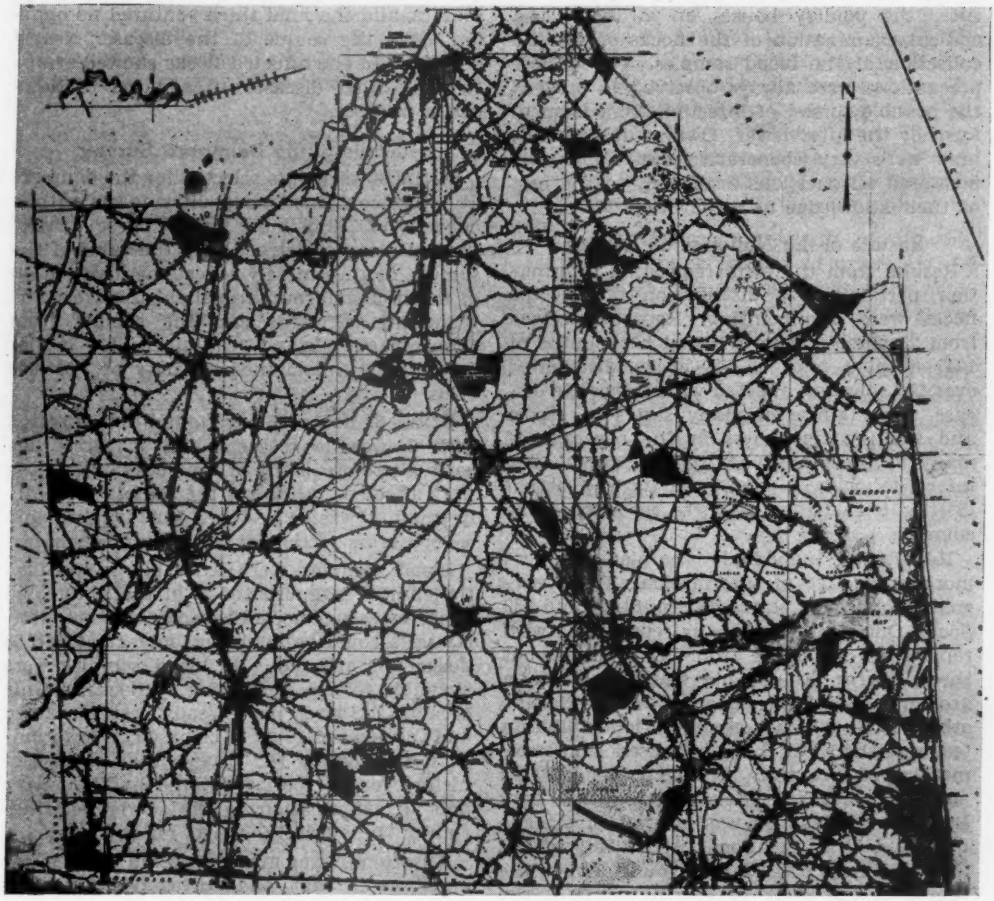

Fig. 1. Sample segments (as indicated by the heavily shaded portions) selected in Sussex County, Delaware. The lightly shaded portions represent incorporated places, forests, and other special areas ordinarily shown on such maps.

were selected at evenly spaced intervals over the island for inclusion in the sample. The island was thus sampled at the same rate as the rest of the area studied. In the statistical analysis this group of farms was treated as an additional area segment.

The survey veterinarian visited all broiler farms with a capacity of 500 or more birds in each of the 40 sample segments, together with the five selected farms on Chincoteague Island. At each farm, the flock owner or a responsible attendant was interviewed to obtain information about the source of the stock, management practices, disease history, and related information. The interview was guided by a questionnaire prepared by the statisticians, outlining in considerable detail the information desired. By adhering closely to the scheduled questions the interviewer was enabled to obtain factual answers, uncolored by the exaggerated statements of some individuals who might be inclined to overestimate the losses sustained on their particular premises.

The flock was then examined by the survey veterinarian for clinical symptoms of Newcastle disease or any other disease that might be present. A small blood sample (1 to 2cc) was collected from each of any 10 birds in every flock to provide a pooled serum sample for a serum-neutralization test to verify the clinical diagnosis made for that flock. It had previously been determined that in view of the rapid spread of the virus in an affected flock the chances of missing a positive diagnosis of previous contact with the virus in a pooled serum sample from 10 birds would be almost negligible. In no instance was the

survey veterinarian refused permission to enter the poultry houses or yards for the clinical examination of the flocks or for the collection of the blood samples. The utmost precautions were always observed to prevent the possible spread of infection from farm to farm by the interviewer. Owners and attendants were very cooperative and apparently answered all questions accurately to the best of their knowledge or recollection.

Results of the Nation-wide Survey

Results from the form requesting information pertaining to distribution of affected flocks were disappointing. Reports received from 21 states during the first six months of 1947 listed a total of 545 flocks, distributed over 176 counties, affected with Newcastle disease. The failure of many states to report and the incompleteness in the coverage of many of those that did report prevent any inference being made regarding the actual distribution of affected flocks throughout the country.

Reports on individual case histories were more productive of information. These covered a total of 17 states, 132 counties, and 230 flocks. One state was heavily represented with reports on 71 flocks from 38 counties, but these figures do not necessarily indicate a greater amount of infection than in some other states. The hemagglutination-inhibition test was the most frequently used laboratory method of diagnosis, although some states made use of the serum-neutralization test. In only a few states was any attempt made to obtain virus isolations. About 70% of the affected flocks consisted of young birds. The source of the stock in over one-half of the affected flocks was reported as day-old chicks; started chicks accounted for about one-fourth. The disease was reported in one turkey flock.

Almost 90% of the affected flocks exhibited respiratory symptoms of the disease; usually nervous symptoms were also present. About 10% of the flocks showed nervous symptoms alone. Most outbreaks in young stock occurred at about the fourth week of age. The average duration of an outbreak was five weeks. Mortality in young birds was uniformly high, averaging 36%, and in adult birds was uniformly low, averaging 12%. Generally all, or nearly all, birds in the affected flocks were reported as showing symptoms of the disease. Only about one-fourth of the affected flocks were reported as showing good recovery. In most laying flocks the disease caused a heavy drop in egg production; up to 100% in many instances.

About one-third of the owners blamed the hatchery as the source of the infection, another third blamed one or more of 20 possible sources, and the final third ventured no opinion as to the source of the disease. Nearly one-third of the affected flocks showed symptoms of other diseases, in addition to Newcastle disease.

Results of the Delmarva Survey

Of the 40 segments selected for the enumeration, 12 contained no poultry farms with a capacity of 500 or more birds. These "blank" segments do not detract from the value of the sample, as they merely reflect the distribution of the broiler farms throughout the area. The remaining segments and the sample from Chincoteague Island contained 83 broiler farms with a combined capacity of 1,018,000 birds.

Of the 83 flocks, 25 were found to be affected with Newcastle disease. On a percentage basis, therefore, 30.1% of the flocks in the area were affected. Although the sample was fairly small, it was so designed that it represents a good cross section of the area under study.

Blood samples were available to confirm the clinical diagnosis for 22 of the 25 affected flocks by serum-neutralization tests, but similar tests could be made for only 27 of the 58 flocks not affected. No blood samples were available for the remaining 34 flocks, mainly because the birds had already been marketed and the diagnosis had to be based on information supplied by the producer as to disease history for the period covered by the survey and an examination by the survey veterinarian of the mortality charts for that period.

An attempt was made to obtain information on diseases that had occurred in previous flocks and the relationship of such disease history to the occurrence of disease in the flocks currently on hand. The results are summarized in Tables I and II for the 25 flocks having Newcastle disease and the 58 that did not have Newcastle disease, respectively.

These data indicate some association between diseases in past and present flocks. The greater incidence of such diseases in flocks having Newcastle disease is also apparent. However, there is no definite proof that other diseases contributed to an outbreak of Newcastle disease. The owner of one flock reported an outbreak of fowl typhoid at about the 5th week of age; Newcastle disease appeared in that flock at about the 10th week. A number of flocks which appeared to have infectious bronchitis, later showed symptoms of Newcastle disease; positive serum-neutralization tests substantiated the later diagnosis.

So far as could be determined, affected flocks contracted Newcastle disease at ages ranging

from one to eight weeks; outbreaks starting most frequently at four weeks. Average mortality data would be meaningless because of variaton in the ages of the birds in the various flocks. In the course of this survey some flocks were examined when the birds were only a few days of age; other flocks were visited when the broilers were nearly ready for market. Figure 2 shows the relation between age of birds and percentage of mortality up to the time of the survey in unaffected flocks. Data for all flocks, includng those classified only by clinical methods, that is, those flocks for which no blood samples were available, were used in compiling these figures. When the birds had already been marketed at the time of the survey, the age at marketing and total losses up to that age were used. The trend lines show that mortality in the affected flocks was considerably higher than in the unaffected flocks after about the 7th week. Up to that age mortality was no higher in the affected flocks than in those not affected; at 16 weeks of age it was 2-1/3 times as high.

There was a distinct relationship between percentage of mortality and size of flock, as measured by the number of birds started. Mortality was higher in the smaller flocks.

Few producers having affected flocks would express an opinion regarding the effect of Newcastle disease on feed consumption, time of marketing, or the liveweight at which the birds would be marketed. The small amount of data obtained on these factors permits only the statement that the producers who were willing to make an estimate felt that the disease delayed marketing by an average of about two weeks.

TABLE I. — COMPARISON OF THE INCIDENCE OF OTHER DISEASES IN PREVIOUS AND PRESENT FLOCKS ON 25 FARMS HAVING NEWCASTLE DISEASE

	Present flocks having -					
Previous flocks having -	No disease	Coccidiosis	Respiratory diseases	Respiratory diseases and coccidiosis	Other diseases	Total
No diseases	2		3	3	1	9
Coccidiosis		1				1
Respiratory diseases	1	1	3	1		6
Respiratory diseases and coccidiosis		2	1	5		8
Other diseases					1	1
Total	3	4	7	9	2	25

Information was obtained on a number of sanitation and management practices that might have a bearing on the spread of infection, but on the whole, practices on farms having Newcastle disease were no different from those on farms not having the disease. About 30% of all producers vaccinated their flocks against laryngotracheitis or fowl pox; 90% disinfected the premises regularly, generally after the sale of each brood of broiler birds; 70% were careful about removing sick birds from the flock and excluding visitors from the poultry yards and houses; 90% had employees who never visited other broiler farms; 80% either buried or burned dead birds promptly; 70% hauled manure off the premises promptly; and no marked rat infestations or difficulties with predatory animals were encountered. Two common practices that seemed to be particularly bad were observed. One of these is the practice, by poultry buyers, of dumping unclean crates from their trucks near the entrance of broiler houses and vigorously sweeping all loose refuse from the truck onto the producers' premises. The other is the practice, by feed dealers, of picking up unused sacks of feed, often from infected premises, for redistribution to other farms. It was reported by

TABLE II. — COMPARISON OF THE INCIDENCE OF OTHER DISEASES IN PREVIOUS AND PRESENT FLOCKS ON 58 FARMS NOT HAVING NEWCASTLE DISEASE

	Present flocks having -					
Previous flocks having -	No disease	Coccidiosis	Respiratory diseases	Respiratory diseases and coccidiosis	Other diseases	Total
No diseases	18	2	2	3	1	26
Coccidiosis	3	3				6
Respiratory diseases	3	1	1	1		6
Respiratory diseases and coccidiosis	9	1	2	6	1	19
Other diseases	1					1
Total	34	7	5	10	2	58

the producers that in most cases feed was delivered to the farms by the dealer and the same truck made deliveries to other producers. Proper sanitary precautions were seldom observed so that feed delivery practices could be a potential method of spreading infection.

Figure 2. Relation of mortality to age of birds in flocks not having Newcastle disease.

All producers contacted in the survey bought day-old chicks as the source of their stock. About 80% bought their chicks from hatcheries within the area; the remainder bought chicks from New Jersey and some of the New England states.

Summary and Conclusions

Two methods of collecting information about the incidence of Newcastle disease (avian pneumoencephalitis) losses caused by the disease, and possible sources of infection indicate that accurate information can be obtained by survey methods. In the concentrated broiler raising area of the Delmarva pennisula, a questionnaire-interview method proved highly successful in measuring the percentage of affected flocks, death losses in affected flocks, incidence of other diseases, and related information. Of 83 broiler flocks with a combined capacity of a little more than a million birds, 25 were found to have been affected with Newcastle disease. Outbreaks started most frequently at about the 4th week of age. Average mortality is not given because of the variation in the ages of the birds in the various flocks. The success of the study depended largely upon establishing a clearly defined broiler area, using scientific sampling procedure, obtaining the cooperation of the broiler growers, and directing questions toward carefully specified objectives.

Reports on incidence and characteristics of Newcastle disease outbreaks over the United States as a whole were requested from state veterinarians, but the results were disappointing from the purely statistical viewpoint. Although many veterinarians made commendable efforts to supply the needed information, the coverage was not complete enough to provide reliable indications of numbers of affected flocks, geographical distribution of outbreaks, or severity of the disease. Reports received from 21 states during the first six months of 1947, listed a total of 545 flocks, distributed over 176 counties affected with Newcastle disease. Useful information with respect to mortality was obtained from the case histories reported. Mortality in young birds averaged about 36% and in adult flocks about 12%.

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2. D. E. Stover. A filterable virus, the cause of a respiratory, nervous disorder of chickens. *Am. J. Vet. Res.* 3(7): 207-213, (April) 1942.
3. J. R. Beach. The neutralization in vitro of avian pneumoencephalitis virus by Newcastle disease immune serum. *Science.* 100(1944):361-362.

Research workers in the U. S. Public Health Service report (*Am. J. Pub. Hlth.* 38, pp. 1263-1272. 1948) finding neutralizing antibodies for avian pneumoencephalitis virus in the sera of children in Alabama and Tennessee, who were suffering or had suffered from a mild affection of the central nervous system and in the sera of adults having an influenza-like syndrome. They conclude:

Although no virus has been isolated, it seems probable from the evidence presented that the Newcastle virus of fowls is the agent responsible for many of the atypical central nervous system infections that have been reported in man during the past few years, and that, as in the fowl, the manifestations are neurological in young individuals and influenza-like in the adult.

It is suggested that pneumoencephalitis virus originating with the fowls has probably spread to man and that in many instances there is a man to man rather than a fowl to man dissemination.

Construction and Architecture of a Small Animal Clinic*

By DAVID BARSKY,
Tupper Lake, N. Y.

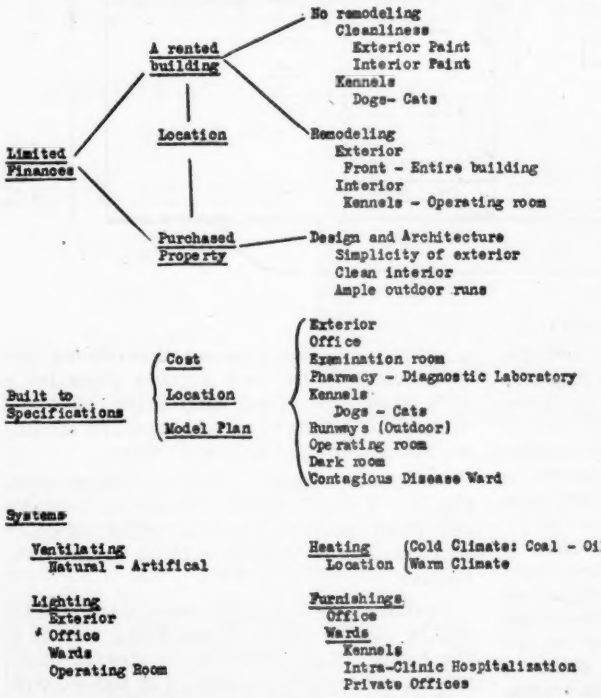
TWO types of buildings will be discussed: (1) where only limited finances are available, and (2) built to specifications. These plans are for one-story buildings.

Limited Finances—Rented Building.—The location for a small animal clinic, when the building is to be rented, is largely governed by the number of patients expected from that area. The desirability of a section in which there is no veterinarian can be seen easily. Of course, if no remodeling need be done, the expense saved is a factor which over-rides a more elaborate building where alterations must be made to adapt the structure to veterinary practice.

If no remodeling is to be done, cleanliness must be sought above all else, as any attempt upon the lessee's part to bring about this necessity entails an expense. Therefore, the paint on the exterior of the building should not be strictly adhered to, as any building that be neat and pleasing. In a city (except in the far West), the more conservative colors are desired, such as medium-dark grey, brown, or dark green. These suggested colors need blends with surrounding property is usually acceptable.

The interior should be painted a light color, preferably grey, but one that does not soil easily and one that can be washed readily. The usual plan is to have walls medium-dark grey (almost pearl grey), two-thirds of the walls' height, with the top third and ceiling white. This paint scheme should be consistent throughout the entire clinic, with the possible exception of the office or reception room or both. In the office, the tenant may give vent to his own individual choice, the majority using conservative colors such as maroon or soft, dark green with mahogany furniture.

The kennels should be of ample size for the dogs that are to inhabit them. For the larger breeds, i.e., collies, German shepherds, setters, pointers, great Danes and similarly proportioned animals, kennels at least four feet in width and height, and approximately five feet deep are suggested. For terriers and like smaller breeds, we suggest kennels at least two and a half feet in width and height, and approximately three feet deep. If at all possible, kennels should be individually lighted. Some veterinarians favor steel kennels, but I do not approve of this plan because of the heat and sound conducting properties of steel. I prefer wooden or wood-fibre kennels with all rounded joints. Newspapers as a kennel floor covering are both economical and sanitary. Paper is obviously more easily changed, and with the expenditure of less time and effort than a sliding tray. The more simple the construction, the less probability of dirt accumulation.



Cat compartments should be of the same size as the kennels for small breeds of dogs. If possible, the cat ward should be isolated from the canine section for obvious reasons.

A Remodeled Building—Rented.—Where the

*This article and the two articles that follow are reprinted by request from the January 1946 issue of *Veterinary Medicine.*

owner is willing to remodel, say from a gasoline station, feed store or other appropriate building, the only necessary exterior remodeling is the front. neatness should prevail and an effort should be made to have it clash with the immediate surroundings as little as possible. The owner of the building usually will observe the veterinarian's wishes, and the veterinarian should pass final approval upon the proposed refacing before the actual reconstruction begins.

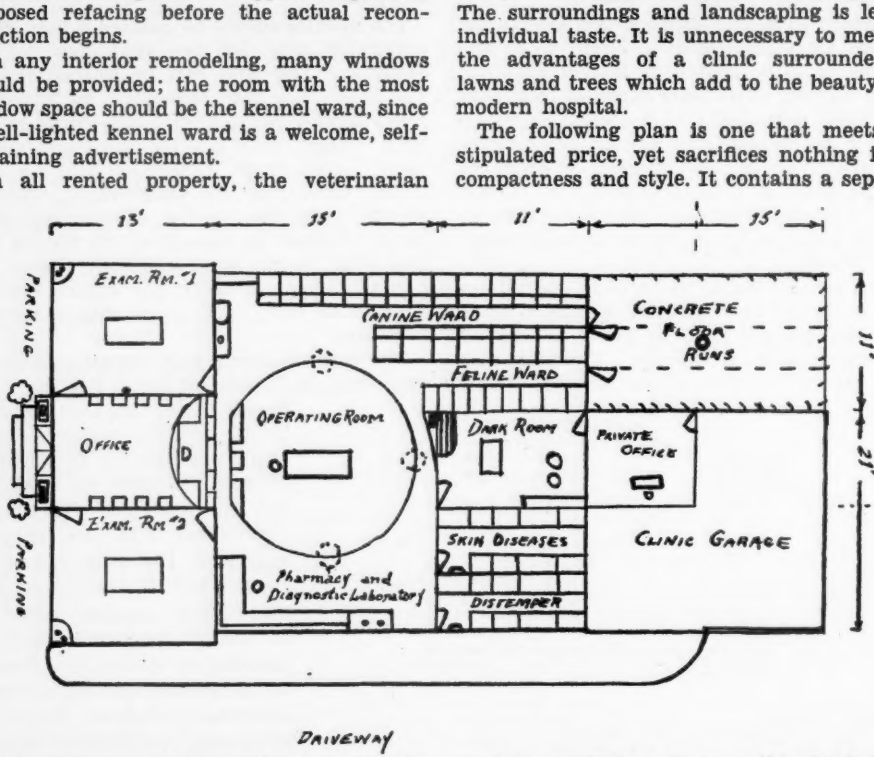
In any interior remodeling, many windows should be provided; the room with the most window space should be the kennel ward, since a well-lighted kennel ward is a welcome, self-sustaining advertisement.

In all rented property, the veterinarian must be governed by the rental fee and the period of his lease. If he plans to make his home in combination with his clinic, the rental fee should be considered as that of both a business property and a residence. The latter suggestion should be carefully considered as the advantages of a combination clinic and dwelling are many.

Built to Specifications—Cost.—The practitioner who plans to build his own clinic must be prepared to spend at least $4,000 for his land and $4,500 for the ensuing construction upon it. Some may believe this to be an extravagant figure, but one who is going to build one's own clinic should build for permanence and for economy in maintenance. Any finished clinic that costs less than the above figures is either a rare bargain, or it is a piece of property that will double its cost in following years because of poor materials, bad construction or faulty workmanship. If one must reduce the outlay below this figure, it is better to rent.

Location.—The city being the source of small animal practice, it is wise to build not too far from it. It is false economy to purchase too small an area of land. Extra land may be profitably converted into extra long, outdoor runs, a fact which I cannot over-emphasize. The surroundings and landscaping is left to individual taste. It is unnecessary to mention the advantages of a clinic surrounded by lawns and trees which add to the beauty of a modern hospital.

The following plan is one that meets the stipulated price, yet sacrifices nothing in its compactness and style. It contains a separate ward for contagious diseases, this divided into two classifications; and includes plans for a dark room, for X-ray and other electrical equipment. All plans may be modified according to builders' or architects' views.



Building Equipment—Heating.—In the warm climates a small burner should be used for hot water purposes. In the colder climates, coal seems to be preferable to oil for financial reasons.

Ventilating.—A natural ventilating system can be utilized easily by employing shields at the bottom of the windows to prevent drafts when the windows are open. The top windows may be lowered for proper circulation.

Lighting.—The operating room should be naturally lighted only by a skylight. The absence of wall windows prevents outside contamination. The artificial lighting should be

focused, holophane lights, particularly in the operating room. In the wards, as much window space should be obtained as possible so that natural light may be utilized to the fullest extent. Proper lighting of this nature is at once economical and gives a clean, pleasing atmosphere. Good lighting conduces to cleanliness, which is a fundamental requirement for small animal clinic. In the office, the lighting may be of conventional fixture type.

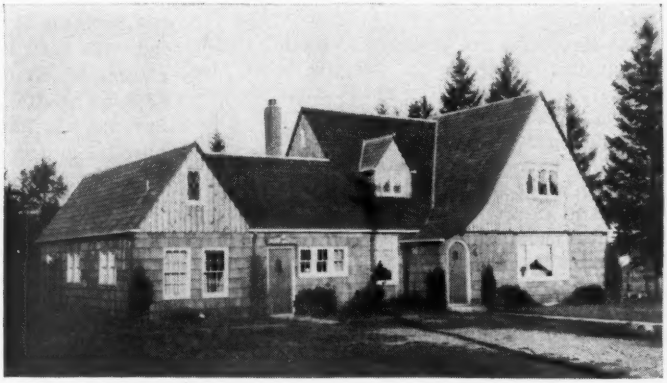
Furnishings.—In the office, standard furniture may be employed. The private office may be furnished to the individual taste, while the wards and laboratories are more professionally furnished by consulting any of the medical supply concern bulletins. The plumbing throughout the hospital is usually attended to by the building contractor, but it must be remembered that when the bathing facilities are erected, a well-constructed stand for colonic and rectal irrigations be added, preferably a non-portable stand. I would suggest the use of linoleum on the floors throughout the building except in the operating room where the tile floors are advisable.

In the plan shown, a basement has been omitted, but it is advisable to include one in the construction. The basement may be used for storage, furnace facilities and installation of an incinerator. The incinerator used for burning deceased patients (and saving the ashes), is practical and worth-while.

The concrete floor runs may be used alternately so that dogs cannot come in contact with each other.

It is a good plan for the prospective builder of a small animal hospital to visit established clinics. From these, he will probably glean ideas which may be incorporated in his own plans. In any clinic that has been designed for permanence, the following points are fundamental: A pleasing exterior, which is necessary to form a favorable first impression; a neat, cheerful reception room, which continues the first impression; a well-lighted kennel ward containing large, airy kennels, which lessens the reluctance of animal owners to the possible "caged" condition of their pets; and finally, sanitary, concrete floored runs of unskimped dimensions, which support a famous hospital's slogan: "the welfare of your pet is our greatest desire."

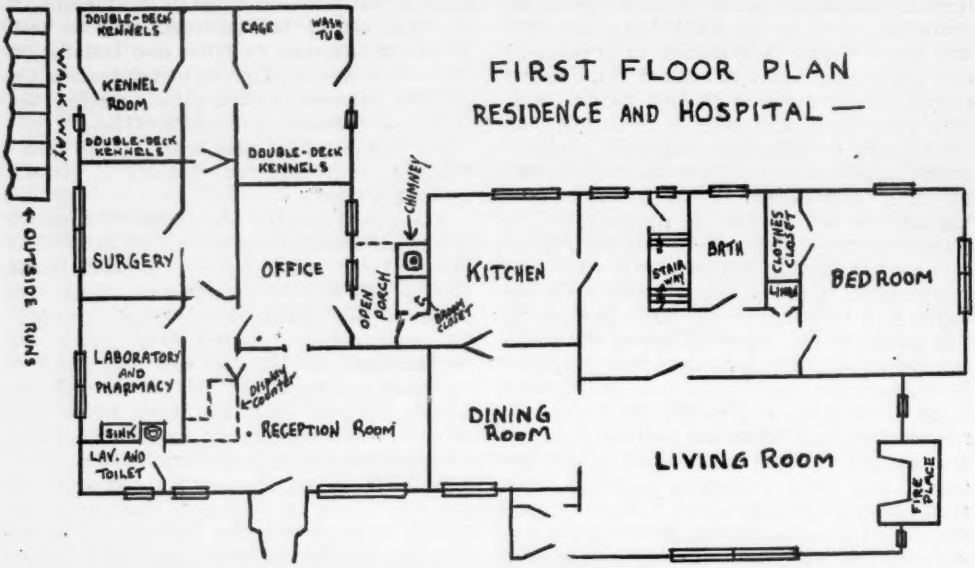
Residence and Small Animal Hospital for a Rural Practice



Hospital and residence of Dr. John S. Stevens, Sequin, Wash.

The hospital and residence shown in the above illustration was erected in the summer of 1940 at a cost of $9,000. It would cost far more at present prices for building. Doctor Stevens is located in a dairy district and his practice includes both large and small animals. It was planned to build a large animal unit later just behind the present hospital, but small animal practice increased so rapidly after the hospital was opened that additional wards for dogs had to be constructed and the large animal unit has not been built. The small animal work is now three times as great as it was prior to the opening of the hospital.

Constructing the hospital and residence as a single unit saved a considerable sum in the cost of the two structures and makes for convenience in operation. As shown in the floor plan the door on the right is the entrance to the residence and the door on the left is to the reception room of the hospital. The residence is completely walled off from the hospital. The connection between them being by way of an open porch in rear of the reception room, which connects the office and the kitchen. This separation avoids getting hospital odors into the residence and the connecting porch gives access from either building without exposure in inclement weather and without going up or down steps. A hot



water heating system avoids the interchange of air between the buildings that might occasionally occur were a hot air heating plant employed.

The structures are designed to have a rustic appearance which is in keeping with the natural surroundings. The entire exterior, roof and walls, except for the gable ends is finished in hand split cedar shakes. The gable ends are done in rounded knotty cedar. The interior finish of the residence is plaster downstairs and knotty cedar upstairs. All outside walls are insulated. The reception room of the hospital is finished in knotty cedar and the remainder of the building in white celotex with light grey trim. The floors of the hospital are of cement. The kennels are double deck of cement and galvanized iron with a drainage system in each which opens into the central drain in the middle of the room.

The cost of maintenance and operation of the hospital is extremely low. Electricity and light for both structures come through single meters which lowers the rates and there is but one heating plant to take care of. Doctor Stevens has had much enjoyment out of his hospital and it has been a business getter. If he were building it again the only changes he would make would be to single panel doors, built in lights in the surgery and eliminate cement floors from the reception room, laboratory, surgery and office. Cement floors are tiresome on the feet and legs and destructive to instruments and other equipment that is accidentally dropped.

A Hospital in Four Years*

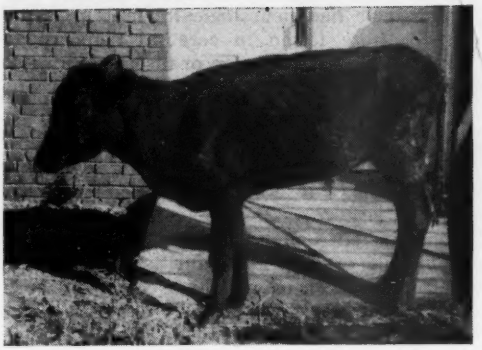
Graduating and beginning practice from scratch in the depression year of 1931, Dr. H. E. Hansen, Ballston Spa, N. Y., contrived in a little more than four years to erect the small animal hospital shown in the illustration. Although lacking much from an artistic viewpoint, it embodies the practical facilities for a dog and cat hospital in a small town (pop. 5000).

The exterior is of plain concrete block construction, which will take a coat of white cement plaster.

The interior is finished smooth plaster over metal lath, the floors concrete, sloped to a center drain in the wards and operating room. Each ward is equipped with a porcelain sink, and there is a large cabinet sink with a drain board in the surgery.

The main ward contains 12 kennels in a double tier, the isolation ward six. They are constructed of wood with inside corners rounded; the fronts and doors of steel bars. Newspapers are used for bedding. The wards are large enough for additional kennels when they are needed.

*Condensed and reprinted from *Vet. Med.* 31:5, p. 229.



A typical Case of X Disease

The B.A.I. commission which made a survey of the occurrence of X disease, hyperakeratosis, found evidence of it in the dairy and beef cattle in 32 states. In the herds which the commission visited, 31% of the animals were affected. The case mortality is estimated at 59%. A virus, a poisonous mineral, and faulty nutrition, or a combination of all three are suspected of being the cause of X disease.

Arthritis in Turkeys Associated with Salmonella Pullorum

Durant and McDougle,[1] Beaudette,[2] and Reis[3] have reported an arthritis in chickens due to *Salmonella pullorum*. This condition is not common in domestic birds in Illinois, though it has been seen occasionally in chickens received at the diagnostic laboratory in the College of Veterinary Medicine, University of Illinois.

September 9, 1948, two turkey poults, three months of age, were presented to the laboratory for examination. The flock had a history of a mild outbreak of an undiagnosed disease, at two weeks of age.

In the present outbreak four or five birds had died during the 10 days previous to September 9th, and 10 or 12 more were sick. Symptoms in the affected birds consisted of lameness, swollen hocks and toes. The turkeys appeared alert but gradually refused to walk, and were eventually picked by others in the flock. The feces appeared abnormally light in color.

At autopsy numerous small white foci were seen in the liver. The affected joints contained a clear, semigelatinous fluid. The heart, lungs and reproductive organs showed no gross pathological changes. A slight enteritis was noted, but no intestinal parasites were found. The crop, proventriculus and gizzard were normal.

Bacteriological cultures were made from the heart, liver and joint fluid; *Salmonella pullorum* was isolated from all three. No other pathogenic organisms were isolated.

It is probable that these turkeys contracted pullorum disease when young poults. Some recovered birds from the initial outbreak appeared to be chronically infected with the disease. The unusual feature of the case is the localization of the organism in the joints of the extremities.

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3. Reis, J. Artrite em galinha produzida por *Salmonella pullorum*. *Arch. I. Biol.* S. Paulo 13, pp. 115-118. 1942.

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Posterior Paralysis in a Cocker Spaniel

At 5:00 p.m. Friday, September 24, a three-year-old, black bitch, in heat 10 days, was brought to my office with a history of being normal in the morning and then in the late afternoon developing a complete posterior paralysis of both hind legs. The dog was unable to use her hind legs in walking but dragged them as she used her front legs. Her characteristic sitting position was one in which she sat on her haunches and kept her hind legs directly beneath her body.

Upon questioning the owner, I could get no history except that she had been in heat for 10 days and had been kept in the cellar and was to be bred the next day. Her temperature was 102.5° F., the buccal mucosa appeared congested; there was a serous lachrymal discharge but no pain upon manual palpation.

I injected subcutaneously 1.5cc of lentin and the dog had an almost immediate bowel movement. The fecal matter was of a semi-solid consistency—grey in color and putrid. She had three or four defecations during a five-minute period. When put in a kennel a few minutes later she vomited, the vomitus contained some indigestible tendinous material of dark color and remnants of dog food. Water was left with the patient and no further treatment given. The following morning upon opening the kennel door the cocker walked out of her cage of her own volition and without any assistance. She walked about normally as though nothing had occurred.

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Cardiovascular Complications of Chronic Nephritis in the Dog

The author[41] reviews some of the literature on the cardiovascular changes in human chronic nephritis, namely, hypertension and hypertrophy of the left ventricle. He discusses the causes of the two conditions.

He states that hypertension does not have to be the intermediate cause between chronic nephritis and left heart hypertrophy, since he has been unable to demonstrate hypertension in nephritic dogs, that had left heart hypertrophy.

He describes the symptoms seen in canine left ventricular hypertrophy but says that the murmur of the rapid beat (*bruit de galop*) heard in human Bright's disease is not heard in dogs; in fact, the rapid heart beat does not seem to exist in canine nephritis.

The author describes the hearts which have enlarged ventricles but he says he cannot state whether left ventricular hypertrophy is a constant lesion in nephritic dogs, since not all the uremic dogs he has seen at Alfort have been autopsied. However he has autopsied dogs with nephritis and has not seen left cardiac hypertrophy.

The dilatation following hypertrophy which is seen in humans is absent in dogs with nephritis. The clinical symptoms which correspond to human cardiac dilatation have been similar to those seen in pulmonary emphysema in dogs; however in the latter condition, the right heart has been dilated.

The author remarks on the absence of hypertension in nephritic dogs. One author he quotes (Clauss, 1910), recorded pressures of 170-212mm of mercury in nephritic dogs with a normal average of 140mm. However, Robin's work is exactly contrary since he has never recorded hypertension but only a normal average of 120mm (systolic pressure).

Dogs were examined for hemorrhages due to hypertension. Petechiae and ecchymoses were looked for especially in the retinae of nephritic dogs. Any hemorrhages seen were due, not to hypertension, but were of traumatic origin.

Another argument for his hypothesis that hypertension does not exist in dogs, is the lack of proof that dogs are subject to, or die from apoplexy. Even though cases are diagnosed as such, no evidence has been put forth to prove the diagnosis. On the contrary, cases which have had neurological symptoms similar to those found in cerebral hemorrhage have had no hypertension or diseased kidneys, and any neurological lesions seen were due to an infection or cause other than hypertension.

The author therefore feels that hypertension is not a cause of left ventricular hypertrophy, either human or canine, and that even left ventricular hypertrophy may not be the result of chronic nephritis. He believes there may be an agent which can cause both conditions simultaneously.

41 Robin, V. Les Complications Cardio-vasculaires de la Néphrite Chronique chez le Chien. (The cardiovascular complications of chronic nephritis in the dog.) *Revue de Pathologie Comparee et d'Hygiene Generale*, 48:600; pp. 442-445. (August) 1948.

Bulletins, Circulars, Reports, etc.

Sulfanilamide, Sulfathiazole and Sulfapyridine in Veterinary Medicine.—A treatise on the pharmacological activity and clinical use of these drugs, including an abstract of the literature. Merck and Co., Rahway, N. J.

Plants Poisonous to Livestock.—By Doctor Osvaldo A. Eckell, professor of pathology, National University of La Plata. A discussion of *Cynodon hirsutus* and other cyanogenetic plants, with briefer notice of *Solanum pseudocapsicum* and other less known plants toxic to cattle and other domestic animals. Twelve black and white illustrations and 10 full-page colored plates. A separate from the annual report of the Faculty of Veterinary Medicine, Universedad Nacional de La Plata, Buenos Aires, Argentina.

Federal Meat Inspection.—Hearings before the Committee on Agriculture House of Representatives on H. R. 5675, H. R. 6259 and S. 2256, April 27, 1948, are interesting reading. Mr. Murry: If the government pays the cost of federal meat inspection, to improve the interstate market for the beef cattle raiser it should pay for the inspection of dairy cattle when they are shipped interstate. Mr. Dolnick: If the government requires the inspection of anything to maintain a standard the Congress has set, it should pay the cost of inspection. Mr. Neuhoff: Federal inspection doesn't help me a bit. It costs me money. It doesn't help sales and the inspectors are a headache. And so on for 55 pages. Obtainable from Representatives and Senators.

Housebreaking the Dog.—The seventh edition of this booklet, one of a series of 12 "Handy Dog Booklets" by the same author, Capt. Will Judy, editor of **Dog World**, has just been announced. The author suggests as a subtitle "A Trip through the Alimentary Canal, with Special Attention to the End of the Journey." He states it is a work on internal sanitary engineering and is founded upon the ancient law of physics—"whatsoever entereth must exit". In any case, since 33,000 copies of previous editions have been sold and sales continue at the rate of 7000 copies a year, it is apparent that the booklet is approved by dog owners. Veterinarians will find it convenient to have a copy handy when asked that ever recurring question, "How can I housebreak him?" Judy Publishing Company, 3323 Michigan Ave., Chicago. Price 30 cents.

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An effective cleansing and emulsifying agent combining the detergent action of soap with the antibacterial properties of the highly effective, non-irritating germicide, Phemerol, which provides cleansing action as well as disinfecting properties in a single preparation.

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Dept. of Veterinary Medicine

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Fort Dodge Penicillin Bougies are now stronger (won't break when properly handled) and self-lubricating (easier to insert). Now supplied in 50,000 units and 25,000 units.

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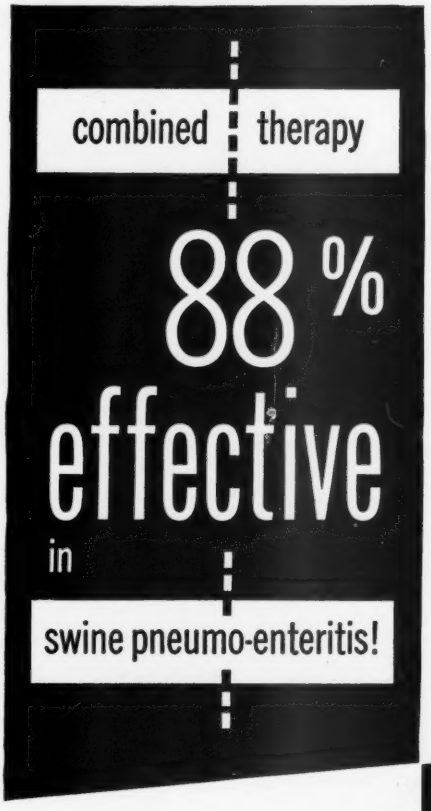

Combination of Sulfamerazine and SULFATHALIDINE has proved effective in 334 (88%) of 380 swine, representing 19 different herds stricken with pneumo-enteritis. The mortality rate of untreated control animals was 100%.*

Sulfamerazine and SULFATHALIDINE were given orally as tablets or in drinking water. Sodium sulfamerazine was administered intraperitoneally or subcutaneously. Both drugs were effective in *single daily doses*, and in *no instance* were toxic symptoms noted.

Sulfamerazine and SULFATHALIDINE, systemic and enteric sulfonamides developed by Sharp & Dohme laboratories, are distinguished by low dosage, high therapeutic efficiency, and minimal toxicity.

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*Edmonds, E. V., *Veterinary Medicine* (in press)

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SULFATOSE

is Practically Neutral!

pH reading 7.0-7.5

Practically the same As Blood

For pneumonia and lung congestion in cattle, pneumonia enteritis complex in swine, and other conditions indicative of sulfonamide therapy.

Neutral on the pH scale is 7.0. As a reading increases above 7.0, alkalinity increases. Blood has a reading of 7.3 to 7.4. Norden SULFATOSE, Concentrated and 5%, has a reading of 7.0-7.5, practically the same as blood.

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100cc	$ .80;	Doz.	$ 9.30
250cc	1.80;	Doz.	21.00
500cc	3.00;	6-500cc	17.60
Doz.			34.90

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250cc	$1.00;	Doz.	$11.40
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"The Mark of Quality"

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HUNT CLUB BREEDERS MIXTURE
What you get per pound of food when you mix
4 Lbs. of HUNT CLUB
1 Lb. of Meat
5 Tablespoons of Melted Lard

We believe ONLY HUNT CLUB *gives you this amazing nutrition!*

NO. 8 MEMO FROM W. E. ARMSTRONG TO VETERINARIANS

PART II — Vitamins and Minerals.

The first part of this message on nutrition appeared in this magazine last month.

11 VITAMINS

Identity	Required* Per Lb. Food	Provided** Per Lb. Food	BIOLOGICAL FUNCTIONS IN DOGS
A	950 Units	4000 Units	Promotes growth, normal reproduction, lactation. Aids resistance to infections—nose, ears, throat, respiratory tract.
D	135-270 Units	1000 Units	Essential for utilization of calcium and phosphorus, normal bone growth, teeth. Important in preventing rickets, in reproduction, in viability of young.
B1-Thiamin	0.5 Mg.	1.0 Mg.	Promotes normal growth. Aids appetite, digestion and assimilation; carbohydrate and fat metabolism. Required for normal reproduction, lactation.
G-Riboflavin	0.8 Mg.	4.5 Mg.	Essential in promoting normal growth of dogs. Essential in nerve tissues and cell respiration.
B7-Niacin	4.5 Mg.	15 Mg.	Prevents disease syndrome called "black tongue." Essential in maintaining normal function of gastro-intestinal tract and skin.
E	?	3900 Mcg.	Essential to fertility and reproduction in various animals, including dogs.
B6-Pyridoxine	?	1.16 Mg.	Symptoms of deficiency: severe microcytic hypochromic anemia in dogs. Convulsions and fits in puppies. Falling hair.
Choline	?	653 Mg.	The Vitamin B Complex factors. Growth promotion, aids healthy skin, hair and fur of most animals. Requirements not definitely determined. Observations during a 240 day period with 30-50 puppies and brood bitches in HUNT CLUB Feeding Kennel have produced no visible evidence that these amounts per pound of food intake are not sufficient.
Biotin	?	.059 Mg.	
Pantothenic Acid	?	5.13 Mg.	
Inositol	?	8.45 Mg.	

*Indicated by Dr. Elvehjem, University of Wisconsin. **Hunt Club Specifications.

9 MINERALS

Elements	Provided**	BIOLOGICAL FUNCTIONS IN DOGS
Calcium	2.17%	Essential for building normal bones and teeth. Important in lactation.
Phosphorus	1.08%	Essential for sound bones and teeth. Important in enzyme activation.
Iron	0.011%	Essential in hemoglobin formation. Aids prevention of nutritional anemia.
Copper	0.00005%	Essential for catalytic conversion of iron into red blood cells.
Iodine	0.0004%	Essential in growth and function of thyroid gland. Important in basal metabolism.
Manganese	0.012%	Essential to normal growth, reproduction and functioning of mammary glands.
Cobalt	0.0002%	Essential in prevention of anemia, together with copper and iron.
Zinc	0.0006%	Aids normal growth. Important in normal development of coat of hair.
Salt	0.82%	An essential part of gastric juices. Will relieve andrenal insufficiency.

**Hunt Club Specifications.

"Border-line starvation" is the descriptive term used by the Nutrition Committee of the American Veterinary Medical Assn., in emphasizing the *lack* of certain elements *needed* by the animal body. This committee of veterinary experts reports that "border-line starvation" includes vitamin A deficiency, amino acid deficiencies, calcium and phosphorus deficiency, and iodine lack in certain sections of the country.

The most sensible advice to follow is to *Feed Optimum Amounts* of every element the body of the dog needs. To use the minimum means skating on thin ice. Cases of complete absence of any of the most important elements are rare, of course (since few dogs "crack up" completely). But "border-line starvation" cases are *common*. Top-rating veterinarians know it! The resulting damage might not show up for a while, but the consequences will *accumulate* and *add up* into real trouble in the end.

For example: Feed a dog a diet complete in every respect *except* lacking in B_1 (Thiamin). First comes loss of appetite, then nervousness...in the end, convulsions and chorea. Large doses of B_1 vitamin bring about dramatic recovery.

Another example: Lack of Pantothenic Acid leads to gastritis, enteritis...eventually to convulsions and coma. This *does not happen* when food contains 5.0 Mg. or more of Pantothenic Acid.

Before a dog can be fed optimum amounts the food requirements must first be known. Then these specific amounts must be provided per pound of food. This results in the best growth, development and condition it is possible to achieve. The rest is up to heredity and environment.

The data herewith show the vitamin amounts that should be provided per pound of dog food for normal body maintenance, according to Dr. Elvehjem, noted animal nutritionist at the University of Wisconsin. Compare them with the *EXTRA AMOUNTS* in HUNT CLUB...put there to help provide for normal reproduction, lactation in bitches; rapid growth, bone, substance in pups; beautiful coats and mellow skins. Also note the mineral content of HUNT CLUB. Note particularly the biological functions of these elements. Could you ask for a better protective guarantee against "border-line starvation"? **W. E. ARMSTRONG**

Follow the Feeding Method of

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Maritime Milling Co., Inc., Buffalo 2, N. Y.

Date_____

☐ Send free sample bag, all charges paid.
(East of Rocky Mountain area only.)

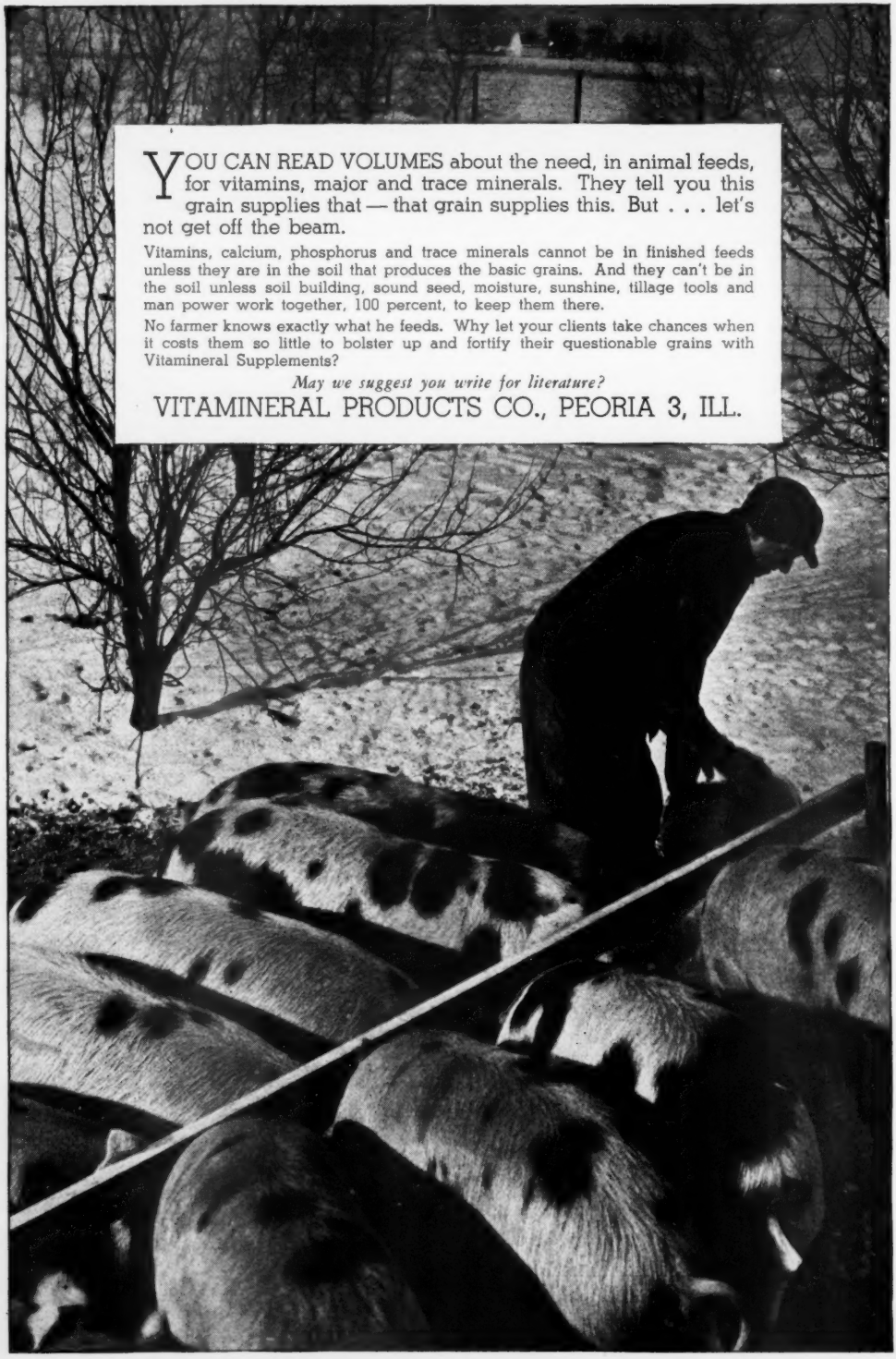
Name_____

Address_____

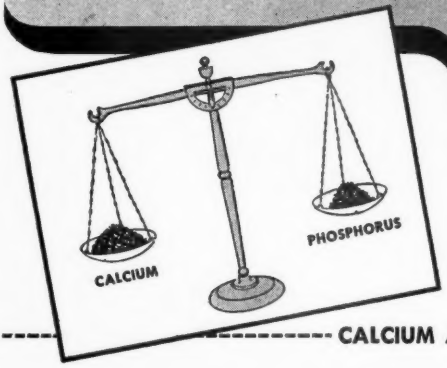
City and State_____

Breed_____ No. of Brood Matrons_____

No. of Pups_____ Do you feed meat?_____


YOU CAN READ VOLUMES about the need, in animal feeds, for vitamins, major and trace minerals. They tell you this grain supplies that — that grain supplies this. But . . . let's not get off the beam.
Vitamins, calcium, phosphorus and trace minerals cannot be in finished feeds unless they are in the soil that produces the basic grains. And they can't be in the soil unless soil building, sound seed, moisture, sunshine, tillage tools and man power work together, 100 percent, to keep them there.
No farmer knows exactly what he feeds. Why let your clients take chances when it costs them so little to bolster up and fortify their questionable grains with Vitamineral Supplements?
May we suggest you write for literature?
VITAMINERAL PRODUCTS CO., PEORIA 3, ILL.

Actual tests show Pard supplies optimum Calcium and Phosphorus in proper balance



The ratio of Calcium to Phosphorus appears to be more important than the actual amounts present. The scale at the left illustrates the nutritional balance achieved thru proper ratio of Calcium to Phosphorus in Pard dog food.

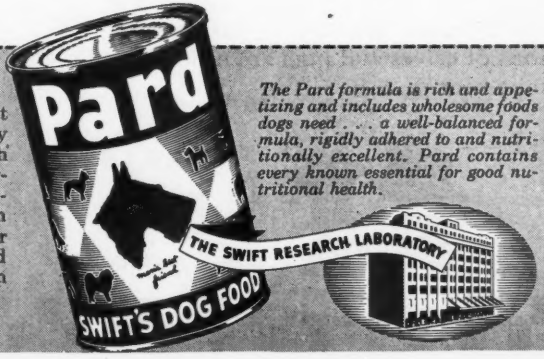
CALCIUM AND PHOSPHORUS CONTENT OF PARD

Based on requirements for rapid growth of pups, and for the female during gestation and lactation.

CALCIUM—Essential, in combination with phosphorus in proper ratio, and with vitamin D, for normal bone and tooth structure. Also important in certain functions of heart, nerve and muscle tissue and iron utilization.

PHOSPHORUS—Vital, in combination with Calcium in proper ratio, and with vitamin D, for normal bone and tooth structure. Necessary for activation of certain enzymes. Important in metabolism of carbohydrates and fats, normal activity of the muscles and output of nervous energy. Also essential for cell structure.

Laboratory Kennel studies are just another step by Swift & Company to assure dogs better health through better foods. Careful quality-supervision is maintained in its manufacture to guarantee uniformity in nutrient content, taste, color, odor and texture. Pard is an easy-to-feed nourishing food that dogs love from the very first sniff.



The Pard formula is rich and appetizing and includes wholesome foods dogs need . . . a well-balanced formula, rigidly adhered to and nutritionally excellent. Pard contains every known essential for good nutritional health.

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FOR ALL...
MORE PROFIT
FOR THE FARMER
It's your problem and ours

More Young Stock Must Be Saved

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Through proper nutrition Purina Chows are helping to save the farmers' young stock. An example of what Purina Products can do when used with good sanitation and management programs is shown by these livability records at the Purina Research Farm in 1947:

93.5% of pigs weaned were raised
96% of dairy heifers dropped were saved
97% of chicks started were raised

RALSTON PURINA COMPANY
St. Louis 2, Mo.

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"MASTICS" REG. U. S. PAT. OFF.

Penicillin IN SOLUBLE STICK FORM
FOR
MASTITIS
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"MASTICS"
A WAX-LIKE SUBSTANCE IN STICK FORM CONTAINING 25,000 UNITS OF PENICILLIN "G".
"MASTIC" IS PUSHED INTO TEAT WHERE IT DISSOLVES IN THE MILK.
TEAT
"MASTICS" HAVE WEDGE SHAPED ENDS FOR EASIER INSERTION.
PROTECTIVE FOIL WRAPPER USED AS APPLICATOR

"MASTICS" are sold:
In quantities of 25 to a box $4.75
In quantities of 100 to a box $18.00

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WRITE FOR DESCRIPTIVE FOLDER

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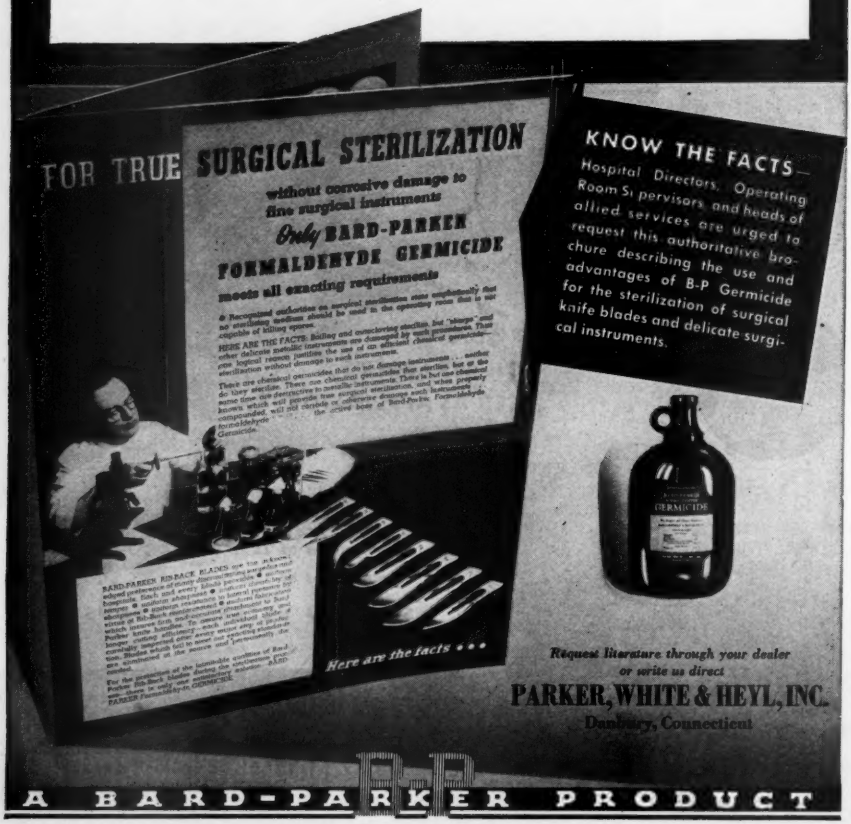
FOR THIS VITAL PROBLEM

. . . only one satisfactory *SOLUTION*

BARD-PARKER FORMALDEHYDE GERMICIDE

TRUE SURGICAL STERILIZATION of delicate steel instruments and keen cutting edges must embrace the total destruction of vegetative bacteria, spore-formers and their spores. Surgical sterility must be attained within a reasonably short period of time to be practical for hospital purposes. The medium or method employed should offer complete protection against rust or corrosive damage to the factory-new qualities of such instruments, leaving their efficiency and life expectancy unimpaired.

The bactericidal and sporicidal potency of B-P Germicide accomplishes the destruction of pathogenic vegetative bacteria within 5 minutes . . . the most highly resistant spores of *Cl. tetani* in 3 hours. It will not rust, corrode or otherwise damage delicate steel instruments or keen cutting edges. NO METHOD OR MEDIUM EXTANT PROVIDES THESE COMBINED, EQUIVALENT PROPERTIES.


FOR TRUE SURGICAL STERILIZATION
without corrosive damage to fine surgical instruments
Only BARD-PARKER FORMALDEHYDE GERMICIDE
meets all exacting requirements
Here are the facts . . .
KNOW THE FACTS—
Hospital Directors, Operating Room Supervisors and heads of allied services are urged to request this authoritative brochure describing the use and advantages of B-P Germicide for the sterilization of surgical knife blades and delicate surgical instruments.
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Request literature through your dealer or write us direct
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Danbury, Connecticut
A BARD-PARKER PRODUCT

Ch. Styx was a Westminster winner about 60 years ago, when Corded Poodle coats were relatively common. At first glance, he looks like an entirely different breed from the Poodles seen today.
Courtesy of Popular Dogs

One of the top Standard Poodles of today is Ch. White Cocade of Salmagundi, owned by Cartlane Kennels. Sire of 6 champions, his own show record includes 41 times Best of Breed, 15 firsts in Non-Sporting Group, and one Best in Show.

IN BREEDING... IN FEEDING

Standards Change!

● Today Poodle coats are almost never corded, largely because the great amount of time and trouble required do not yield anything as trim, practical, and stylish as modern clips.

In the same way, elaborate home-cooked and supplemented feedings for dogs are disappearing in the face of the greater efficiency and dependability of modern prepared dog foods. The Gaines formula of 19 years ago was a first, great step toward the modern standard of a single, convenient food that meets all the nutritional needs of a dog.

As new, more exact knowledge made it possible, Gaines scientists improved the formula—are still helping lead the way to even higher nutritional standards. This continuous improvement makes the GAINES of today a food that more than meets the standards of today . . . a food whose practical results have made it the leading brand among breeders—and America's largest-selling dog food.

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MODERN FOOD FOR MODERN DOGS

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"Nourish EVERY INCH of a Dog"

FOR MORE THAN TWENTY YEARS

An outstanding record in Successful Control of Distemper

Lederle Laboratories introduced canine distemper products of virus origin to the American veterinarian in 1929. Since then, intensive investigational work has been concerned with constant improvement of the antigenic value of these products. Twenty years of extensive immunological research supported by repeated observations in the field, have also amply demonstrated that the vaccine-virus method of immunization, which is based primarily upon the original Laidlaw-Dunkin method, is the most useful and dependable procedure for obtaining lifelong immunity to canine distemper with maximum safety.

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CANINE DISTEMPER VACCINE (Inactivated Virus) *Lederle*—For temporary active immunity.

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ANTI-CANINE DISTEMPER SERUM *Lederle*—For immediate, temporary passive immunity and therapy.

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CANINE DISTEMPER VACCINE
(*Inactivated Virus*) *Lederle*
1 dose (5 cc. vial) 2 doses (2—5 cc. vials)

CANINE DISTEMPER VIRUS
(*Tissue Origin*) *Lederle*
1 dose (10 mg. tissue in ampul with diluent in syringe)

ANTI-CANINE DISTEMPER SERUM *Lederle*
20 cc. vial—100 cc. vial

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You name it—Gro-Pup's got it! All the minerals and vitamins dogs are known to need in a blend of wholesome ingredients! Gro-Pup's the first dog food to receive the Seal of Approval of the AVMA and the AAHA.

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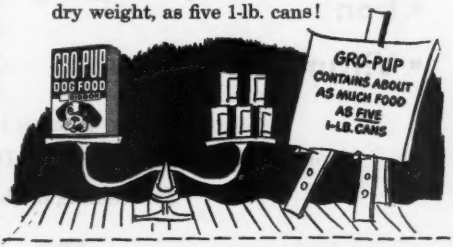
• Committee on Foods •

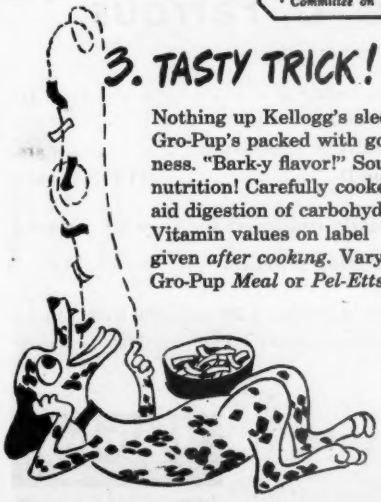
2. ARE YOU FOOLED?

Why buy water? Many canned dog foods contain 70% water. With Gro-Pup, *you* add the moisture! Gro-Pup is actually 92% food . . . why, a 25-oz. box gives a dog about as much food, dry weight, as five 1-lb. cans!



3. TASTY TRICK!

Nothing up Kellogg's sleeve! Gro-Pup's packed with goodness. "Bark-y flavor!" Sound nutrition! Carefully cooked to aid digestion of carbohydrates. Vitamin values on label given *after cooking*. Vary with Gro-Pup *Meal* or *Pel-Etts*.



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Made by Kellogg's of Battle Creek

- **Calcium—Phosphorus**
- **Iron**
- **Vitamin D**

When it is necessary to give supplements of calcium, phosphorus, iron, and vitamin D to small animals in order to insure proper functioning of the various metabolic processes of the body—

Diostate* D, Ferrous

(Compressed Tablets)

Each tablet contains approximately:	
Ferrous Sulfate	1 gr.
Dicalcium Phosphate	5 grs.
Purified Bone Phosphates	2⅛ grs.
Vitamin D	333 U. S. P. units

Diostate D, Ferrous is especially indicated for growing puppies and pregnant and lactating females.

Available in bottles of 100 and 1000 from Upjohn branches or through your local prescription pharmacies.

DEPARTMENT OF VETERINARY MEDICINE

Upjohn
KALAMAZOO 99, MICHIGAN

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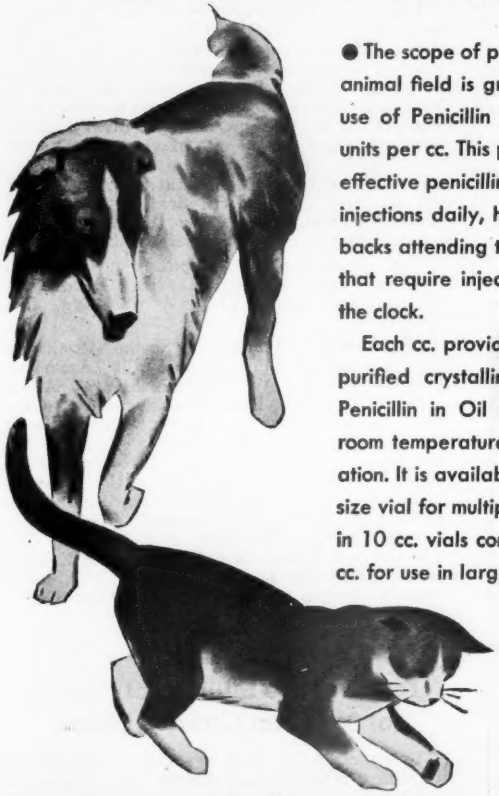
PENICILLIN IN OIL AND WAX

IN A DOSAGE FORM ESPECIALLY DESIGNED FOR THE SMALL ANIMAL FIELD

CSC



● The scope of penicillin therapy in the small animal field is greatly widened through the use of Penicillin in Oil and Wax, 100,000 units per cc. This preparation makes possible effective penicillin treatment with only 1 or 2 injections daily, hence overcomes the drawbacks attending the use of aqueous solutions that require injection every 3 hours around the clock.

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You'll Be Interested to Know That . . .

More Extensive Animal Health Program Planned

A campaign of public relations for the veterinary profession in eight different phases will be pressed vigorously on a nation-wide scale throughout 1949 by the American Foundation for Animal Health, it has just been announced.

The decision to extend the program throughout the coming year was taken at a recent meeting of Associated Serum Producers, whose member companies underwrite the cost of the program and sponsor the American Foundation for Animal Health.

Producing companies who are contributing the funds for the campaign say that this is the broadest program in the 15-year history of Associated Serum Producers.

Information to the public on veterinary matters will seek to make animal owners more conscious of disease hazards, will show animal owners the importance of correct veterinary diagnosis and treatment and the dollar-and-cents value of relying on the veterinarian for such treatment, as well as to warn them of the danger of self-medication and "drug store" diagnosis. The importance of veterinary science to the national welfare, and the great service the veterinarian renders in his own community and to the nation as a whole will be stressed.

LIVESTOCK HEALTH ODDITIES
THE SAME GERM THAT CAUSES SWINE ERYSIPELAS ALSO AFFECTS HUMANS, FISH, TURKEYS AND LAMBS.
IN ROMAN TIMES PLINY ADVISED PREVENTING RABIES BY EATING LIVERS OF MAD DOGS
MANY VETERINARIANS HAVE CONTRACTED UNDULANT FEVER FROM WORKING WITH INFECTED LIVESTOCK.

American Foundation for Animal Health

Type of Illustrations Appearing in Farm Papers

Resulting from such publicity is an increasing public appreciation of the veterinary profession, and an ever-greater use of the veterinarian's services. Dissemination of information relative to the proper status of a veterinarian in the community is a long-range job which must be continuous to be effective in that the veterinarian may be seen in his proper niche—that of guardian of the health of the nation's livestock.

The motion picture film, "Valiant Years" will be released in 1949 for general showings throughout the country, to such groups as 4-H clubs, farm bureaus, granges, vocational agriculture students, civic clubs, and kindred organizations.

The series of messages on "What the Veterinary Profession Means to Mankind" will again stress animal disease hazards, and the importance of veterinary service in helping the owner to avoid losses. Releases will be made to 3000 newspapers and articles and cartoons will also appear in state and national farm publications stressing this aspect of veterinary medicine. Radio releases will go to news editors and farm editors of 400 stations throughout the country. These will deal with seasonal disease problems and show the value of the veterinarian in coping with them.

Full details on the campaign in each area may be had by writing American Foundation for Animal Health, Liberty Building, Des Moines, Iowa.

Members of Associated Serum Producers who organized and support the American Foundation for Animal Health are: Allied Laboratories, Inc.; Blue Cross Serum Co.; Corn Belt Laboratories, Inc.; Fort Dodge Laboratories, Inc.; Grain Belt Supply Co.; Jensen-Salsbery Laboratories, Inc.; Liberty Laboratories; Missouri Valley Serum Co.; Norden Laboratories; Pitman-Moore Co.; Sioux City Serum Co.; Sioux Falls Serum Co.; The Columbus Serum Co.; The Corn States Serum Co.; The Gregory Laboratory; The National Laboratories Corp.; The Royal Serum Co.; The Southwestern Serum Co.; The United Serum Co.

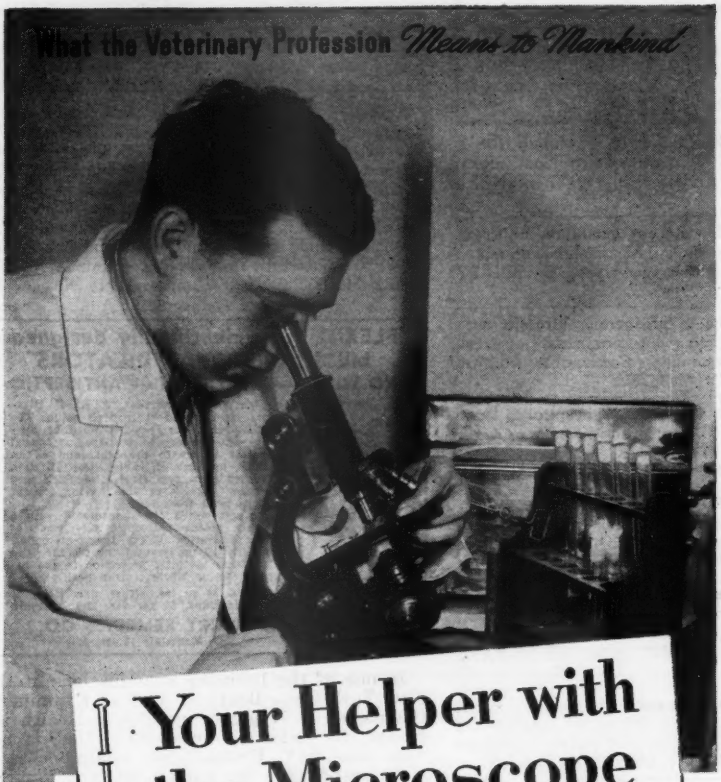
■

To Purchase Millions of Pounds of Mexican Canned Meats

Contracts have been awarded to provide for purchase from Mexico during the current fiscal year of 133,200,000 pounds of canned meat and meat products for export to foreign countries by the U. S. Department of Agriculture.

The meat under contract will be processed in 13 Northern Mexican plants, several of which have been recently constructed, and will provide an outlet for approximately 520,000 cattle. The price for delivery to the international border is 28 cents per pound for the meat and 18 cents per pound for the edible meat by-products.

Since export of cattle from Northern Mexico was halted because of foot-and-mouth disease in other areas in the country, the purchase of this meat is a part of the over-all program for the control and eradication of foot-and-mouth disease in Mexico.



Your Helper with the Microscope

On your farm, the worst livestock killers are invisible. They creep up unseen . . . deadly germs and viruses . . . to spread death to your pigs, cows, poultry, and other stock. Were it not for this veterinarian behind the microscope . . . losses from these hidden killers might be much greater than they are. He checks obscure diseases, detects dangerous bacteria and viruses, interprets complex tests of blood and tissues. This man, and your veterinarian, working hand in hand are adding millions to the nation's livestock profits, preventing losses by prompt and ACCURATE diagnosis.

AMERICAN FOUNDATION FOR ANIMAL HEALTH

THIS MESSAGE

is appearing in leading farm magazines this month, sponsored by

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Classified Advertisements

For Sale, Assistants Wanted, Positions Wanted, etc., 10 cents per word, payable in advance. Minimum charge $2.50; replies 25 cents additional if sent in care VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago. Copy must be received by the 3rd of month.

WANTED: Used Small Animal Operating Table, Enamel or Stainless Top. State condition, make, price, etc., in letter. Address No. 833 VETERINARY MEDICINE.

POSITION WANTED: Recent graduate of Italian University (Bologna), desires assistantship with mixed practitioner. Address No. 830 care VETERINARY MEDICINE.

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FOR SALE: Long established, fully equipped veterinary practice, town of 30,000 located in the heart of the Wisconsin dairy district. Plenty of small animal practice. Address No. 829 care VETERINARY MEDICINE.

WANTED: Partnership or purchase of small animal practice in east or midwest, by recent graduate of accredited school. Give full particulars. Address No. 825 care VETERINARY MEDICINE.

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FOR SALE: New and rapidly growing small animal hospital. Well equipped, drugs, runs, etc. Main highway in Los Angeles suburb. Good, long-term lease. Reason: draft. Address No. 823 care VETERINARY MEDICINE.

KENNEL BLANKS—Pedigree, boarding, training, bookkeeping system—send 50c for complete set of samples. Keep up on dogs—Dog World, $3 one year; $5 two years. Judy Publishing Company, 3323 Michigan Blvd., Chicago 16.

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FOR SALE: Veterinary small animal hospital, established over twenty years, consisting of hospital, two-car garage with receiving kennels and a modern seven room residence on about three acres of land located in a small progressive town near Cleveland. Owner selling because of illness. Address Norman A. Beck, Broker, 1661 Rydalmount Road, Cleveland Heights, Ohio. Phone Fairmount 1407.

FOR SALE: Well equipped small animal hospital owned and operated by Dr. N. B. Tennille in Toledo, Ohio. Long established and lucrative practice. Member A.A.H.A. Building can be purchased or leased. Address West Toledo Animal Hospital, 3165 Sylvania Ave., Toledo, Ohio.

Attractive proposition for experienced small animal Veterinarian to take over and eventually own well established practice and hospital. Will net between ten and fifteen thousand yearly depending on ability to handle. Neatness, honesty and initiative a must. Small or large investment as you wish. More interested in the man than large initial payment. NYS License. Include snapshot and all information in first letter. Confidential. Address No. 834 care VETERINARY MEDICINE.

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MEDICATED TEAT DILATORS
NO WIRES — TWO SIZES — ANTISEPTIC

To the most discriminating veterinarians, FLEX-O Dilators have proved their high value. The ONLY cloth-covered dilators that contain no wires—a positive safeguard against injury to the teat, and as an added measure of value these Dilators are made in two sizes, "regular" and "large," the large size having greater length and diameter.

The soft woven cloth, saturated with a highly potent antiseptic salve, carries the medication INTO the teat canal, directly to the seat of the trouble, and furnishes soothing protection to the injured lining while tissues heal.

Packed 24 to jar, either size. Price to Veterinarians, $4 per doz. jars, postpaid

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In one of the licensing examinations of the New York State Board of Medical Examiners, the paper on Hygiene and Public Health included the following question: "What is bovine mastitis? Under what conditions may it be responsible for human infection?" "Bovine mastitis," said one candidate, in answer to the first part of the question, "is inflammation of the cow's rudder."—*J. A. M. A.* in "Tonics and Sedatives".

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McKeon's
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TRADE MARK REG. U.S. PAT. OFF.
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Treatment of Sarcoptic Mange
ECONOMICAL—Costs few cents per treatment
SAFE—Harmless even for cats
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The largest grant of the Rockefeller Foundation made in 1947 was 10 million dollars to the China Medical Board.

■

Ten Kinds of Barks

The dog's owner, if he be observing, can code his dog's barking into ten classifications: 1. Excitement of chasing a cat, rat, or game; 2. Warning bark, slightly uncertain; 3. Warning bark—full and certain; 4. Lonesome; wants company or to be let out; 5. Play and its pleasure; 6. Impatient or half hysterical (do not confuse with No. 4); 7. Danger—wants master's attention; 8. Fear; 9. In the heat of the fight; 10. Pain.—*Dog World.*

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MASTITIS

We believe that when the U. S. Department of Agriculture tells us "Early Detection of Mastitis is EXTREMELY IMPORTANT," they but voice the opinion of every Graduate Veterinarian. If so, and to the end that you may have first hand PROOF of their superiority, we would like to mail you FREE OF CHARGE a full size box of our better—dependable—

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Quantity	8 Ounce C.S. Vitaform	350 cc C.S. Vitaform	350 cc C.S. Compound (Without Vitamins)
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1 lb.	per lb.	$1.50
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25 lb.	per lb.	1.35
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Suitable for making 10% Aqueous Solution

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6 lb. bags	per lb.	$0.50
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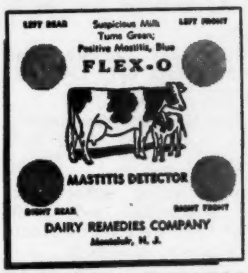

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■

Scientists at the Idaho Agricultural Experiment Station recently reported in the *Journal of Animal Science,* that steamed bone meal, fed choice-free, is much more palatable for beef steers than defluorinated superphosphate, though both proved satisfactory supplements.

■

All 24 members of the freshman class accepted at the new College of Veterinary Medicine of the University of Illinois at Urbana are World War II veterans and all had completed two years of preveterinary training when enrolled September 13, 1948 from all sections of the state.

■

Coming Meetings

Research Workers in Animal Diseases in North America, Palmer House, Chicago, Nov. 29, 1948. Sec. W. H. Feldman, Mayo Foundation, Rochester, Minn.

U. S. Public Health Service, Short Course in Laboratory Diagnosis of Rabies, Laboratories of the Communicable Disease Center, Atlanta, Ga., Dec. 6-10, 1948. Acting Chief, E. S. Tierkel, 605 Volunteer Bldg., Atlanta 3.

Dr. Naylor
Medicated TEAT DILATORS
Medicated surgical dressings for the Teat Canal

A dependable treatment for retaining normal milk flow through the canal of injured teats — Scab Teats, Cut or Bruised Teats and for keeping teat canal open in post-operative therapy.

Dr. Naylor Dilators are soft, absorbent, surgical dressings impregnated with SULFATHIAZOLE and Methyl Violet. The medication is IN the Dilators. They perform the same function in the teat canal as a medicated surgical dressing applied to external wounds.

Due to their soft, absorbent construction, Dr. Naylor Dilators fit either large or small teats and allow for normal contraction and expansion of the sphincter muscles while Dilator is inserted. They carry antiseptics and healing agents into teat canal to combat infection and promote healing; furnish soft, absorbent protection to the injured lining and keep teat canal open in its natural shape while tissues heal.

Easy to insert, stay in the teat. Protected in antiseptic ointment until ready for use.

Dollar Package (contains 45 Dilators) ..... $8.00 Per Doz.
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Nebraska State Veterinary Medical Association, Corn Husker Hotel, Lincoln. Sec. L. V. Skidmore, College of Agriculture, Lincoln 1. December 7-9, 1948.

New York State Veterinary College Conference for Veterinarians, Jan. 5-7, 1949. W. A. Hagan, Dean, Ithaca.

Ohio State Veterinary Medical Association, Deshler-Wallick Hotel, Columbus, Jan. 5-7, 1949. Sec., F. J. Kingma.

Wisconsin Veterinary Medical Association, Park Hotel, Madison, Wisc., Jan. 6-7, 1949. Sec. B. A. Beach, Division of Veterinary Medicine, University of Wisconsin, Madison.

California State Veterinary Medical Association, Mid-Winter Conference, San Luis Obispo, Jan. 10-12, 1949. Sec. Chas. S. Travers, 16th and Mission, San Francisco 3.

Maine Veterinary Medical Association, Augusta, Jan. 12, 1949. Sec. S. W. Stiles, Falmouth Foreside, Portland.

Indiana Veterinary Medical Association, Severin Hotel, Indianapolis, Jan. 13-15, 1949. Sec. W. W. Garverick, Zionsville.

Texas State Veterinary Medical Association, Texas Hotel, Fort Worth, Jan. 17-19, 1949. Sec. E. A. Grist, Box 951, College Station.

Arkansas Veterinary Medical Association, Little Rock, Feb. 17-18, 1949. Sec. T. D. Hendrickson, Route 5, Box 422A, Little Rock.

Iowa Veterinary Medical Association, Hotel Fort Des Moines, Des Moines, January 18-20, 1949, Sec. C. C. Franks, Capital City Bank Bldg., Des Moines.

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Bibliography:

1. *Am. Jour Vet. Res.*, Part II, Apr., 1946.
2. *Proc. Soc. Exper. Biol. & Med.*, Oct., 1946.
3. *Am. Jour. Vet. Res.*, July, 1946.

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Michigan State College post graduate conference for veterinarians, Michigan State College, East Lansing, Jan. 19-20, 1949, Dean, C. S. Bryan, School of Veterinary Medicine.

Mississippi State Veterinary Medical Association, Pinehurst Hotel, Laurel, Jan. 20-21, 1949. Sec., S. A. Cox, Jackson.

Illinois State Veterinary Medical Association, Abraham Lincoln Hotel, Springfield, Jan. 26-28, 1949. Sec. A. G. Misener, 6448 N. Clark, Chicago 26.

New Jersey Veterinary Medical Association, Hotel Hildebrecht, Trenton, Feb. 3-4, 1949. Sec. J. R. Porteus, P. O. Box 938, Trenton.

■

Deaths of Veterinarians

Sigurd J. Olson, Wilcox, Nebr., KCVC'10, died January 18, 1948.

R. T. Fisher, Stillwater, Okla., KCVC'10, died May 16, 1948. He had served in the B.A.I. many years.

G. E. Harrey, Grove City, Pa., UP'13, died May 26, 1948.

James N. Eagle, Kansas City, Kan., KCBC '10, died of a heart attack July 1948. He had practiced many years and also had served on the city board of health. In late years he had served as meat inspector in the B.A.I. in Kansas City packing plants.

Ivor Williams, Albuquerque, N. Mex., KSC '47, died July 9, 1948 of pulmonary edema.

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25 lb. drum	65c per lb.
150 lb. drum	58½c per lb.

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Crystalline Sodium Salt

100,000 Oxford Units	per vial	$ .24
200,000 Oxford Units	per vial	.40
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Bottle of 1000		13.00
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Bottle of 100		$ 1.20
Bottle of 1000		9.85
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Vitamin A	5000 USP Units
Vitamin C	5000 USP Units
Vitamin D	500 USP Units
Niacin	50 mg.

Bottle of 100	$ 2.75
Bottle of 500	13.00
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B. J. Timmermann, Carlyle, Ill., CVC'16, died July 9, 1948.

P. J. Huffman, Athens, O., KCVC'09, was killed in an automobile accident July 18, 1948.

G. I. Fargus, Mercersburg, Pa., UP'17, died July 30, 1948.

J. B. Finch, Ramsey, N. J., ONT'96, died August 16, 1948.

Major Manuel C. Kastner, Camp Carson, Colo., KSC'33, died August 23, 1948. He had returned from service in Germany and was Chief Veterinary Inspector at the Quartermaster Market Center in Denver. He was the recipient of many medals for war and occupation service.

G. G. Baker, Spencer, Ia., ISC'07, died August 23, 1948. He had served his state association as president and had been councilman of Spencer for 12 years.

Walter C. Snyder, Buffalo, New York, CORN '18, died August 24, 1948.

Lawrence E. Spong, Wichita, Kan., KSC'37, died August 29, 1948 in Veterans' Hospital in Wichita. He had been field veterinarian for the B.A.I. except for the four years he served in the Veterinary Corps.

Elry R. Crenshaw, Garland, Tex., SW'16, died September 8, 1948. He was one of the organizers of the present Texas Veterinary Medical Association.

Harold L. Campbell, 58, Tuscola, Ill., KCVC '15, died September 9, 1948. He served in World War I and had practiced 21 years in Tuscola.

Clarence L. Adams, 75, Danielson, Conn., AMER'96, died September 12, 1948. He had practiced at Danielson since graduation—52 years.

Fred Boener, 59, Drexel Hills, Pa., UP'12, died September 16, 1948. For 25 years he had been a member of the faculty of the School of Medicine of the University of Pennsylvania. He was affiliated with the Bacteriology Department.

Frank W. Miller, Los Angeles, Calif., ST JOS', died October 5, 1948. He had been with the B.A.I. since his graduation.

George A. Dick, Brookline, Pa., UP'04, died October 15, 1948.

W. J. Butler, Helena, Mont., NY-AMER'03, died October 31, 1948.

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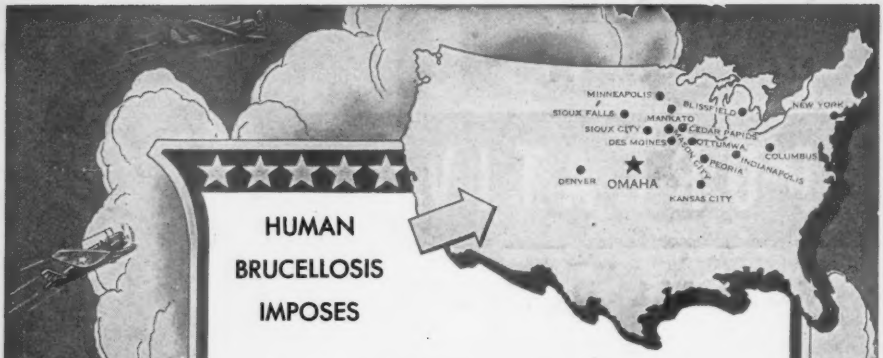

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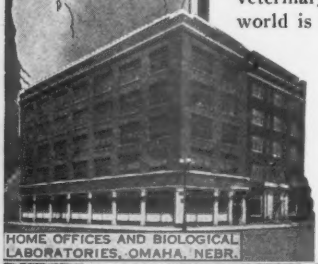

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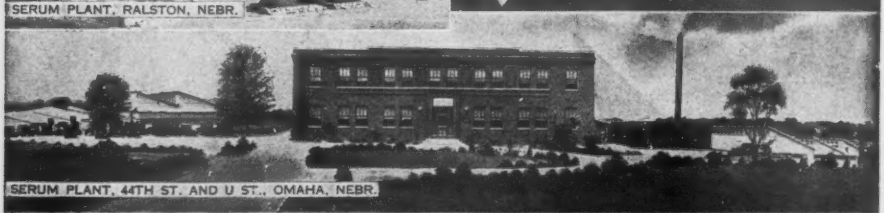

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